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AVIATION SAFETY LETTER

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Learn from the mistakes of others;
you'll not live long enough to make them all yourself ...

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GUEST EDITORIAL

As the Director of the National Organization Transition Implementation Project (NOTIP), it is my pleasure to provide you with an update of this project in this edition of the *Aviation Safety Letter* (ASL). The NOTIP is responsible for determining and implementing changes to the Civil Aviation organization and workforce to enable the successful implementation of a sustainable safety management system (SMS) oversight framework for the industry, in accordance with the Transport Canada Civil Aviation (TCCA) Integrated Management System (IMS).

Civil Aviation has undergone many changes since the organizational restructuring in 1995. New concepts and approaches have been introduced in successive key strategic documents such as *Challenge '98*, *Flight 2005*, and more recently, *Flight 2010*. In early 2005, TCCA had begun a review of its organizational structure in response to evolving realities in both the industry and the government. By 2013, 46 percent of the current Civil Aviation workforce will be eligible for retirement, or will have already retired. Given the current and predicted workforce demographics, replacing our employees to continue the current safety oversight regime is not feasible. Major changes need to be made in the way we work, not just in the industry, but within the authority as well.

The goal is to transition the organization to the "end state" model by 2010, when SMS is fully implemented in aviation enterprises—formalizing a concept of operations that Civil Aviation has been migrating towards since SMS implementation began. This organizational model will allow further flexibility in sharing expertise and maintaining technical competencies, as well as delivering the required level of service to the industry. Our program will be delivered using multidisciplinary teams who are responsible for the oversight of enterprises within the industry.

Under the new model, headquarters will continue to be responsible for the development of policy, regulations and standards, and the delivery of specific centralized operations. Regions will continue to be responsible for implementing the majority of the Civil Aviation Program. A dedicated team is being formed to manage the transition issues over the coming years. I invite you to visit the Civil Aviation Web site, www.tc.gc.ca/civilaviation, for further information and updates, including frequently asked questions and a feedback mechanism on the organizational review project.

Judy Rutherford
Director
National Organization Transition Implementation Project

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Turns after takeoff—at night and IFR

Dear Editor,

The article in *Aviation Safety Letter* (ASL) issue 3/2004, "When Night VFR and IFR Collide," was very informative. To me, it reinforces the need to prohibit turns before 1 500 ft AGL during all IFR and night VFR operations into all operators' SOPs. If these procedures were implemented, trained for and reinforced into everyday operations, this type of accident could be prevented. Turns should only be allowed under these circumstances: for terrain avoidance, a departure instruction/procedure, or collision avoidance. "Black hole" departures create the "somotogravic illusion," which causes the crew to believe they are in a climb when the aircraft may indeed be descending. Under these conditions, extra vigilance by both crew members must be exercised in regards to aircraft vertical speed, climb performance and airspeed. Too often, the "killer norm" is for the pilot flying to start turning immediately after takeoff, while the pilot not flying is transmitting on the radio, and writing on the flight log when the aircraft, if allowed to descend unnoticed, is seconds away from ground contact. Operators need to implement SOPs for their crews to train to climb straight ahead and closely monitor aircraft performance, while maintaining a "sterile" cockpit to at least a minimum of 1 500 ft AGL.

Wayne McIntyre
Saskatoon, Sask.

Distraction and interruption in the cockpit—head-down work

Dear Editor,

In a review of 35 non-fatal airline incidents attributed primarily to crew error, it was concluded that failure to monitor and/or challenge the pilot flying (PF) contributed to 31 out of the 35 occurrences. In the incidents studied, the pilot monitoring, or pilot not flying (PNF) reported that preoccupations with other duties prevented them from monitoring the PF closely enough to catch an error being made while taxiing or flying. In 13 of the 35 occurrences, the PNF was preoccupied with some form of head-down work, most commonly paperwork or programming the flight management system (FMS).

Recently, I was assisting in the evaluation of aircraft equipment on international routes. The captain had approximately 20 000 hr total time, and about 3 000 hr in command on the type. The first officer was newly hired, with a new type certificate on the airplane, and about 1 000 hr total time. About 1.5 hr after departure, in cruise at FL 350, we entered an area of heavy convective build-ups, with imbedded thunderstorms. I noticed that the first officer, who was the PNF at the time, started reprogramming the FMS (to circumnavigate the weather) without first advising the captain that he was going head-down. At that time, the aircraft was on auto-pilot. The PNF then experienced difficulties in entering waypoints, and requested assistance from the captain, who immediately helped him, abandoning the sight of the instrument panel and the weather radar display. The aircraft entered clouds and met severe turbulence. While still on auto-pilot and trying to maintain the selected flight level, the aircraft entered into a series of high-speed stalls. It took the crew about 30 s to stabilize the flight.

The lesson? In this case, the PNF did not advise the PF that he would reprogram the FMS after he became aware of the deteriorating weather. The PF then abandoned monitoring the radar at a critical moment and elected to attend to a less critical task. Somebody must always fly the airplane, even during automated flight. Periods of head-down activity, such as programming the FMS, are especially vulnerable because the PNF's eyes are diverted from other tasks. It is essential that the standard operating procedures (SOPs) specify when it is recommended or allowed to go head-down.

Captain Jan Jurek
International Civil Aviation Organization (ICAO)

Company discrete frequency vs ATF?

Dear Editor,

Earlier this year I lifted off from the Beaver Lake Forestry pad, east of Lac La Biche, Alta. I made a call on the aerodrome traffic frequency (ATF), 123.2, that my intention was to fly to the Tanker Base at the Lac La Biche airport. A few minutes later, I called turning from right base to final for Runway 29 at 3 500 ft and 3 mi. At about 1 mi., a CL-215 pulled out onto the runway and began backtracking on Runway 29. At the same time, an Astar lifted off from its hangar in a southerly departure. Again, no contact on 123.2. After landing at the Tanker Base, I was informed that "their" frequency was 122.05! Exclusive use of an unpublished frequency is unprofessional and keeps other airport users "out of the loop". Should all ATFs be made into mandatory frequencies (MF)?

Name withheld upon request

Good reminder to all. Use of company discrete frequencies is allowed but not at the expense of the ATF, or even a MF for that matter. —Ed.

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Safety Hazard Alert—Call Sign Confusion

by Larry Lachance, Director, Safety and System Performance, NAV CANADA, and Ross Bowie, Director, Air Navigation System Service Design, NAV CANADA

NAV CANADA tracks all operating irregularities in an effort to identify safety hazards and find ways to reduce the probability of accidents. Lately, we have seen a disturbing increase in the number of instances where similar call signs have caused confusion among pilots and controllers, leading to situations where there is an increased risk of loss of separation between aircraft. Call sign confusion could also lead to an increased risk of controlled flight into terrain or obstacles.

In a recent typical incident, two aircraft operated by the same airline were approaching a busy airport from the same direction. They had four-digit flight numbers, and the first, third and fourth digits were identical—only the second digit was different. The aircraft nearest to the airport was cleared to 3 000 ft, but the crew in the other aircraft read back that clearance and started descent from 9 000 ft. Fortunately, the controller noted this error and intervened before there was a conflict with another flight.

From the pilot's perspective, the problem is aural confusion. Clearances and instructions already contain headings, altitudes, airway and runway numbers, and if call signs are similar, it is easy to understand how confusion could result. Crews may be completing a challenge/response checklist or other task when a controller issues an instruction, and may react based on hearing just part of the flight number. Add to this the fact that for a given pilot, flight numbers change often.

For the controller, who may be responsible for over a dozen aircraft, the problem could also be visual confusion, because the controller relies on call signs on radar and other displays to distinguish among aircraft.

Regardless of cause, call sign confusion is occurring too often, and airlines, pilots and controllers have to take concerted action to reduce the probability of confusion and the risk of a serious accident.

The root of the problem is the way air carriers assign flight numbers. Ideally, scheduling schemes and the assignment of flight numbers would ensure that flights with similar call signs would not appear in the same controller's sector. Flight number assignment is, however, driven by different considerations, and normally does not address the potential for confusion. Based on incident records, it appears that risk would be reduced by using a maximum of three digits in flight numbers. Even when using three digits, instances where the same three digits are used in different positions (e.g. 461 and 416) should be avoided. Of course there will be instances where different airlines are using the same flight number, but this has less potential for confusion because crews would key on the airline name.

Until air carriers take steps to deal with the root of the problem, awareness on the part of both pilots and controllers is critical to reducing the risk of call sign confusion.

NAV CANADA has recently highlighted the problem in internal communications, reminding controllers to advise affected crews of the existence of aircraft with similar-sounding call signs on the frequency as soon as they become aware of the situation.

Pilots are encouraged to recognize when the potential for confusion exists, and to take extra care to listen attentively. It goes without saying that pilots should take great care to use the proper flight number at all times. It is also very important to use proper phraseology and to pay particular attention to readbacks. Pilot situational awareness is part of the solution. In several recent instances, pilots have incorrectly accepted clearances that were clearly inappropriate—headings or altitudes that did not make sense based on current aircraft position or intent.

Call sign confusion is a worldwide problem and other countries have completed valuable studies with recommendations aimed at reducing the safety risk. NAV CANADA intends to continue its own studies and to incorporate the lessons learned around the world in a comprehensive aeronautical information circular (AIC) that provides more detailed advice to air carriers, pilots and controllers. △

Thoughts on the New View of Human Error Part I: Do Bad Apples Exist?

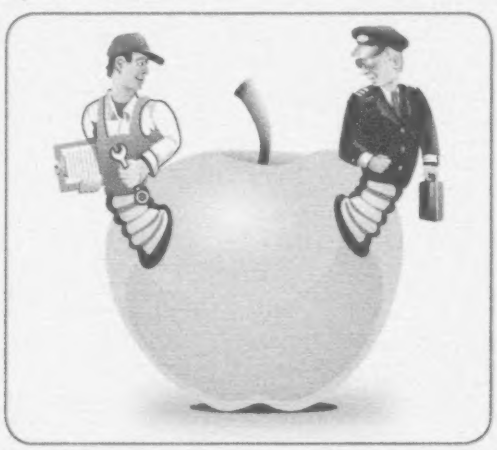
by Heather Parker, Human Factors Specialist, System Safety, Civil Aviation, Transport Canada

The following article is the first of a three-part series describing some aspects of the "new view" of human error (Dekker, 2002). This "new view" was introduced to you in the previous issue of the Aviation Safety Letter *(ASL) with an interview by Sidney Dekker. The three-part series will address the following topics:*
Thoughts on the New View of Human Error Part I: Do Bad Apples Exist?
Thoughts on the New View of Human Error Part II: Hindsight Bias
Thoughts on the New View of Human Error Part III: "New View" Accounts of Human Error

Bad Apples: Do They Exist?

Before debating if bad apples exist, it is important to understand what is meant by the term "bad apple." Dekker (2002) explains the bad apple theory as follows: "complex systems would be fine, were it not for the erratic behaviour of some unreliable people (bad apples) in it, human errors cause accidents—humans are the dominant contributor to more than two-thirds of them, failures come as unpleasant surprises—they are unexpected and do not belong in the system—failures are introduced to the system only through the inherent unreliability of people."

The application of the bad apple theory, as described above by Dekker (2002) makes great, profitable news, and it is also very simple to understand. If the operational errors are attributable to poor or lazy operational performance, then the remedy is straightforward—identify the individuals, take away their licences, and put the evil-doers behind bars. The problem with this view is that most operators (pilots, mechanics, air traffic controllers, etc.) are highly competent and do their jobs well. Punishment for wrongdoing is not a deterrent when the actions of the operators involved were actually examples of "right-doing"—the operators were acting in the best interests of those charged to their care, but made an "honest mistake" in the process; this is the case in many operational accidents.



Can perfect pilots and perfect AMEs function in an imperfect system?

This view is a more complex view of how humans are involved in accidents. If the operational errors are attributable to highly competent operational performance, how do we explain the outcome and how do we remedy the situation? This is the crux of the complex problem—the operational error is not necessarily attributable to the operational performance of the human component of the system—rather the operational error is attributable to, or emerges from, the performance of the *system* as a whole.

The consequences of an accident in safety-critical systems can be death and/or injury to the participants (passengers, etc.). Society demands operators be superhuman and infallible, given the responsibility they hold. Society compensates and cultures operators in a way that demands they perform without error. This is an impossibility—humans, doctors, lawyers, pilots, mechanics, and so on, are fallible. It should be the safety-critical industry's goal to learn from mistakes, rather than to punish mistakes, because the only way to prevent mistakes from recurring is to learn from them and improve the *system*. Punishing mistakes only serves to strengthen the old view of human error; preventing true understanding of the complexity of the *system* and possible routes for building resilience to future mistakes.

To learn from the mistakes of others, accident and incident investigations should seek to investigate how people's assessments and actions would have made sense at the time, given the circumstances that surrounded them (Dekker, 2002). Once it is understood why their actions made sense, only then can explanations of the human–technology–environment relationships be discussed, and possible means of preventing recurrence can be developed. This approach requires the belief that it is more advantageous to safety if learning is the ultimate result of an investigation, rather than punishment.

In the majority of accidents, good people were doing their best to do a good job within an imperfect *system*. Pilots, mechanics, air traffic controllers, doctors, engineers, etc., must pass rigorous work requirements. Additionally, they receive extensive training and have extensive systems to support their work. Furthermore, most of these people are directly affected by their own actions, for example, a pilot

is onboard the aircraft they are flying. This infrastructure limits the accessibility of these jobs to competent and cognisant individuals. Labelling and reprimanding these individuals as bad apples when honest mistakes are made will only make the *system* more hazardous. By approaching these situations with the goal of learning from the experience of others, *system* improvements are possible. Superficially, this way ahead may seem like what the aviation industry has been doing for the past twenty years. However, more often than not, we have only used different bad apple labels, such as complacent, inattentive, distracted, unaware, to name a few; labels that only seek to punish the human component of the system. Investigations into incidents and accidents must seek to understand why the operator's actions made sense at the time, given the situation, if the human performance is to be explained in context and an understanding of the underlying factors that need reform are to be identified. This is much harder to do than anticipated.

In Part II, the "hindsight bias" will be addressed; a bias that often affects investigators. Simply put, hindsight means being able to look back, from the outside, on a sequence of events that lead to an outcome, and letting the outcome bias one's view of the events, actions and conditions experienced by the humans involved in the outcome (Dekker, 2002). In Part III, we will explore how to write accounts of human performance following the "new view" of human error. △

COPA Corner—Flying Clubs—Why Bother?

by Adam Hunt, Canadian Owners and Pilots Association (COPA)

The flying clubs of Canada have a long history. Many of today's clubs were formed in the 1920s with the assistance of the Royal Canadian Air Force (RCAF), when it was considered by the government of the day to be in the national interest to get as many Canadians flying as possible. During World War II, many elementary flying training schools that were part of the British Commonwealth Air Training Plan were run by the nation's flying clubs.

Today, many airplane pilots don't belong to clubs—they just go to the airport, fly their own aircraft and then go home again. Many times, they won't even see or talk to anyone else. They aren't undergoing training or renting their aircraft—so why bother belonging to a club?

There are many types of clubs; many do rent aircraft or provide instruction, but some offer other services, such as operating airports or providing guest speakers and organizing aviation events. So if you are not training or renting, then here are some of the benefits of belonging to a club:

- You can make use of the expertise at the club—learn from the instructors and other senior pilots.
- You can take part in safety recency seminars and other educational events.
- Many flying clubs organize aviation speakers from whom you can learn and keep up to date.
- Being around other pilots will help motivate you and keep you interested in flying.
- Many clubs hold flying events such as fly-ins and fly-out events, where aircraft are flown on cross-countries to far-off destinations. This will give you experience that you might not pursue on your own.
- Some clubs organize specific training opportunities, such as survival training or underwater escape training.
- Some clubs sponsor "mentor programs," where more experienced pilots are paired with students and new licence holders, to help guide them through the learning process and the first few hundred hours of flying.
- Flying clubs often have members with specific knowledge of local weather and terrain conditions.
- Flying clubs often have associated aircraft maintenance operations which can be a great source of knowledge and help with aircraft issues.
- Flying clubs and their members can provide support when there are difficult circumstances to deal with—accidents, injuries or deaths.

Canada's flying clubs have a lot to offer today's pilots, even those who own their own aircraft. Belonging to a club can help connect you to what is going on in aviation in Canada, and just may give you better tools to lower your flying risks. Most clubs have Web sites that list their activities, or you can find most of them at www.copanational.org under "Learning to Fly." △

The Canadian Business Aviation Association Column—Training to Bridge the Knowledge Gap

The Canadian Business Aviation Association (CBAA) has recently embarked on a major project to facilitate aviation-oriented training for its members and the aviation community at large. This initiative is the result of observations from the association's management of the Private Operator Certificate (POC) Program.

Gaps were identified in the essential skills and knowledge required for personnel employed at all levels within the Canadian aviation industry. One potential outcome of the management knowledge gap, if not properly addressed, can be ineffective implementation of safety management systems (SMS).

Although CBAA's experience is primarily with private business aviation, its expertise can be useful to other segments of the commercial aviation community, such as: entity charter; air taxi; small scheduled carriers; flight training schools; specialty operations; and maintenance and manufacturing organizations.

There is often limited access for small operators to high-quality essential training for such subjects as human factors, fatigue awareness, high altitude indoctrination, aircraft surface contamination, low-energy awareness, crew resource management, decision making, controlled flight into terrain, and specific navigation operations, etc. CBAA's new training initiative aims to fill that need.

In addition to organizing various seminars, CBAA is partnering with existing training providers to offer valuable training as a service to its members, as well as making this training available to the aviation industry. Visit the CBAA Web site at www.cbaa.ca for the latest information on training seminars. △

Transport Canada Update—ICAO Amendment 164—Language Proficiency Rating (LPR)

by Larry Cundy, Chief, Personnel Licensing, General Aviation, Civil Aviation, Transport Canada

Introduction

In 1998, the International Civil Aviation Organization (ICAO), taking note of several accidents and incidents where pilots' and air traffic controllers' inadequate language proficiency were contributory factors, formulated Assembly Resolution A32-16, and subsequently directed work by the ICAO Council and the Air Navigation Commission. As a direct result of that work, ICAO adopted amendment 164 to the Standards and Recommended Practices (SARPs), Annex I to the Convention on International Civil Aviation—Personnel Licensing, on March 5, 2003, with an effective date of November 27, 2003. This amendment requires language proficiency for pilots, air traffic controllers and aeronautical station operators. It also calls for high-quality aviation-specific language training materials and programs, as well as the development of academically-sound language testing services.

Transport Canada (TC) acknowledges the legitimate safety concerns that ICAO has cited in support of this amendment; however, TC has also noted that there is a significant amount of work required to develop the infrastructure for standardized testing and oversight of the test facilities and services.

The Language Proficiency Study Group (LPSG)

In accordance with the SARPs and guidance material developed by ICAO, the General Aviation Branch of TC is responsible for the development and implementation of language assessment and test standards for pilots. The Air Navigation Services and Airspace Branch is responsible for the implementation of these same standards for air traffic controllers and aeronautical station operators. To achieve a comprehensive plan within the limited time frame for implementation, the General Aviation Branch established the Language Proficiency Study Group (LPSG) in September 2004. The LPSG is comprised of representatives from the TC Licensing Division and the Air Navigation Services and Airspace Branch, as well as industry personnel from the *Association Québécoise des transporteurs aériens*, *Les Gens de l'air du Québec*, Air Transport Association of Canada, Canadian Owners and Pilots Association, Air Line Pilots Association, Canadian Air Traffic Control Association, Air Canada Pilots Association, Canadian Aviation Maintenance Council, Canadian Business Aviation Association, NAV CANADA and the U.S. Federal Aviation Administration.

The LPSG has completed a considerable amount of work to date in accordance with the terms of reference and work plan; this includes the development of the required policies, procedures and draft notices of proposed amendment (NPA) to the *Canadian Aviation Regulations* (CARs).

The LPSG is currently developing formal assessment tools and guidance material for the delegated persons

who will be involved in the conduct of testing for the operational language level. TC is also developing informal assessment guidelines for assessing applicants for the expert language level 6. To satisfy the international requirements, these policies and procedures must not only address future licence holders, but also existing licence holders. For Canada, this involves the assessment of some 55 000 current Canadian licence holders.

Details of the work completed to date

1. In 2004, the LPSG developed a work plan, implementation procedures and NPAs to the CARs that provided a starting point for formal industry consultation. This began with the Special Part IV Canadian Aviation Regulation Advisory Council (CARAC) meeting, which was held on March 31, 2005. The required NPAs were presented, reviewed and accepted with minor revisions. The NPAs are now waiting in the regulatory queue for the opening of a Justice Department file.

2. A language level 6 file assessment methodology and process has been developed. This process will result in the issue of language proficiency assessments—level 6 French and/or English for the majority of Canadian licence holders who have already demonstrated proficiency through training, flight testing and the completion of written examinations. This process is consistent with the ICAO SARPs and ICAO Guidance Material (Document 9835, Chapter 5), and allows TC to apply the assessment methodology to current licence holders in advance of the 2008 implementation date.

3. Agreement was obtained through the CARAC process and from the LPSG members to proceed with the approval and publication process of the NPAs to the CARs with the understanding that language levels and validity dates would NOT BE PRINTED on licences. This means that the language rating will be printed on the personnel licence indicating either French and/or English language proficiency; however, the language level and expiry date will not be displayed, thus avoiding any potential discrimination on the basis of language proficiency level.

4. A document of specifications for an aviation-language proficiency testing system has been developed, and provides a pertinent and specific framework for test development by language professionals. The purpose of the test is to provide reliable, valid and practical evaluation of pilot/flight crew language proficiency in accordance with the ICAO language proficiency requirements criteria, as published in ICAO Annex 1 and the *Manual on the Implementation of ICAO Language Proficiency Requirements, Document 9835.*

What's next?

A company has been selected to develop the Aviation-Language Proficiency Testing System. Work has begun on the development of the language proficiency test (French and English) and is expected to be completed in the fall of 2006.

TC Civil Aviation Management Executive (CAMX) has approved the design and implementation of a new licence booklet format for pilot and air traffic controller licences (decision record of meeting held on October 27, 2005). This new licence booklet is a security-related document that improves the entire personnel licensing process, with a consolidated and secure pilot and air traffic controller licence format, which includes the licence holder's photo.

As a result of this decision, the language proficiency rating (LPR) implementation is now integrated with the licence booklet project. This new booklet will not only be used for the issue of the LPR, but also for the administration of the validity period of the LPR in cases where the document holder has not attained an expert level 6.

Additional NPAs will be required as a function of this decision, not only for the new licence booklet implementation, but also for the changes associated with the simplified endorsement format of the LPR on the pilot and air traffic controller licence. These NPAs are currently under development and will be presented at the next CARAC Part IV Technical Committee meeting.

Where can I get more information?

Further LPR information will be available on the TC, General Aviation Web site later this year, and you can look forward to an in-depth article on the new licence booklet in the *Aviation Safety Letter* (ASL) soon.

Questions and answers!

1. Why introduce a new requirement to establish language competency of Canadian pilots? Is it because Canada has an aviation safety problem related to radiotelephone communications?

   As a signatory to the ICAO Convention on Civil Aviation, Canada has agreed to implement and maintain standards in accordance with the ICAO Annexes. ICAO has demonstrated that there have been a number of accidents where a significant factor was the inability to communicate adequately by the pilot and the air traffic controller because of a lack of proficiency in a common language. Although there have been no accidents in Canada related to language proficiency, TC acknowledges this identified safety issue.

2. Does this new regulation apply to everyone who holds a pilot licence or permit in Canada?

   In accordance with the ICAO standards, these new standards will apply to private, commercial, airline transport pilot and air traffic controller licences, but will NOT apply to any other licences or permits (glider, balloon, gyroplane pilot licences, ultralight, recreational, and student pilot permits).

3. Are Francophone pilots obliged to have an English language rating in order to be authorized to fly in Canada, other than in Quebec and in the National Capital Region?

   Canadian licences issued after March 5, 2008, will require either a French or an English language rating (or both). There is no airspace restriction attached to the language rating while operating in Canada; French-speaking pilots with a French language rating will have the same freedom to fly in Canada as they do presently.

4. Will Canadian airspace have designated language zones?

   There are no airspace designations or airspace restrictions, and none are planned in association with this rating.

5. Do foreign pilots have to speak either English or French before they are allowed to fly in Canada, including Quebec?

   The provisions of the ICAO Convention on Civil Aviation and Annexes apply to foreign operators and foreign pilots operating in Canada. As of March 5, 2008, foreign pilots must be able to communicate with the air traffic services (ATS) facility on the ground in Canada. These pilots must, therefore, hold licences with language ratings appropriate to the service provided by the ATS facility on the ground.

6. Will the United States also be implementing a language proficiency regulation?

   The United States has indicated their full support for the ICAO SARPs, and is currently developing an implementation plan.

7. What is the cost to the pilots for obtaining the LPR endorsement on their licence?

   Approximately 96 percent of licence holders in Canada will receive either a French or English (or both) language rating from TC free of charge prior to March 5, 2008. Foreign citizens holding Canadian licences, as well as Canadians requiring formal language testing after March 5, 2008, may incur some cost. Details of the implementation are being developed.

8. Who will be responsible for evaluating language proficiency among pilots—TC or the aviation industry?

   TC will develop the standards for language evaluation and will delegate the application of those standards to the industry.

9. Will francophone pilots wishing to obtain an LPR in English be charged a fee if they wish to have both an English and French rating?

   Canadian francophone licence holders requesting an English rating before March 5, 2008, may submit evidence of their competency in English to TC. This process will not involve any cost to the pilot. This will apply only in cases where TC has not been able to establish the pilot's English language competency through a review of available records.

10. Do you not think that, as a result of this new regulation, francophone pilots will be at a disadvantage compared to their anglophone colleagues, with respect to employment opportunities because they have less than a level 6 English language rating endorsed on their pilot licence?

    To address this concern, TC has agreed not to endorse a language level on the licence—only language proficiency in English or French (or both).

11. In order to avoid the expense of language training, do you think that air carriers will be forced to demand a level 6 language rating from all pilots applying for employment with them?

    Since the pilot licence will only have a rating of English or French or both, it could be a matter of company policy to determine whether further training would be warranted because of demonstrated ability in the use of the language.

Many of you asked for information on this topic. Hopefully this article answered most of your questions. As stated earlier, we will provide further information in the near future. △

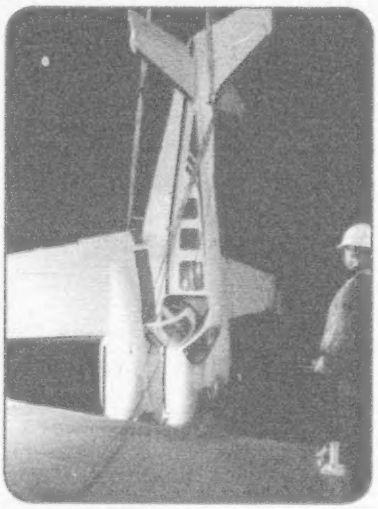
Invest a few minutes in your safe return home this winter...
by reviewing your knowledge on airspace requirements and procedures in the TC AIM, section RAC 2.0.
Visit www.tc.gc.ca/CivilAviation/publications/tp14371/RAC/2-0.htm today!

RECENTLY RELEASED TSB REPORTS

The following summaries are extracted from Final Reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified and include the TSB's synopsis and selected findings. Some excerpts from the analysis section may be included, where needed, to better understand the findings. We encourage our readers to read the complete reports on the TSB Web site. For more information, contact the TSB or visit their Web site at www.tsb.gc.ca. *—Ed.*

TSB Final Report A03O0171—Controlled Flight into Terrain (CFIT)

On July 7, 2003, at approximately 09:58 Eastern Daylight Time (EDT), a Beech 58TC Baron aircraft crashed into Lake Ontario, Ont., approximately 3 NM southeast of the Toronto City Centre Airport. The privately owned and operated aircraft was carrying out a localizer/distance measuring equipment (LOC/DME) B instrument approach to Toronto City Centre Airport, after a flight from Lansing Municipal Airport, in Chicago, Illinois. When the aircraft did not arrive at the airport, and failed to respond to transmissions from the tower, a search was commenced. Patchy fog in the area resulted in ceilings variable from zero to unlimited, and visibility from 1/8 mile to more than one mile. Several hours later, the Metropolitan Toronto Police Marine Unit found debris on the surface of Lake Ontario. The aircraft was located the following day by the Ontario Provincial Police, using a sidescan sonar. The aircraft was essentially intact, resting vertically on its nose at a depth of 220 ft. The deceased pilot was located in the aft cabin of the aircraft. He received minor injuries in the impact, but failed to egress the aircraft for unknown reasons, and died as a result of drowning.



Recovery operation of the aircraft

Findings as to causes and contributing factors

1. During the latter stages of a non-precision instrument approach, the pilot lost situational awareness, specifically of his altitude. As a result, he descended below the minimum descent altitude (MDA) and continued a controlled descent in instrument meteorological conditions (IMC) until the aircraft struck the water.
2. Factors that contributed to the loss of situational awareness were non-precision approach, poor visibility, rushed or incomplete checks, level of instrument proficiency and visual illusion created by surface-based fog.

Finding as to risk

1. Minimum altitudes on Canada Air Pilot (CAP) approach plates are presented differently from minimum altitudes on U.S. Federal Aviation Administration/National Aeronautical Charting Office (FAA/NACO) approach plates, which could create confusion and contribute to an unsafe approach.

TSB Final Report A03W0194—Power Loss and Dynamic Rollover

On September 16, 2003, a Bell 206B was supporting a diamond drilling crew working on the side of a mountain about 80 NM north of Mayo, Y.T. The helicopter was observed descending to a creek-bed staging/refuelling area. As it reached approximately 20 ft above ground, the observers lost sight of the helicopter behind an embankment and then heard impact sounds. On reaching the landing site, the observers found the helicopter lying on its right side between two fuel drums. The helicopter had sustained substantial damage, and the pilot, the sole occupant, had been fatally injured. The time of the occurrence was approximately 12:05 Pacific Daylight Time (PDT). There was no post-crash fire.

Accident investigators examine the scene of the accident

Analysis

Damage to the rotor drive system and the mast indicated low or no power being transmitted from the engine at impact, although the throttle was fully open, and the engine was operating. The amount of fuel on board prior to the occurrence could not be determined. However, the quantity had been planned to be near the minimums required by regulations. Fuel consumption would have been considerably higher at the higher power requirements during slinging operations, and the reserve quantity may have been less than originally planned. An additional shuttle of a load of hydraulic components would have further reduced the reserve fuel quantity by at least 2.0 gal. The pilot had abruptly departed for the refuelling site, which may suggest a low fuel state.

With an aft longitudinal centre of gravity (CG) and a right lateral CG, the helicopter was probably in a tail-low, right-side-low attitude. When combined with the lateral manoeuvring toward the right during the approach, this attitude would have increased the tendency for the fuel to migrate to the right rear corner of the fuel tank. The fuel pump intakes probably unported, causing an interruption in the fuel flow and a loss of power. With the engine relight system armed, any resumption of fuel flow could result in an engine relight, or series of relights, but without the time required for the engine to accelerate and transfer a useable amount of power to the rotor drive system prior to impact.

A momentary power interruption at a crucial moment may have distracted the pilot, and caused the helicopter to overshoot the intended touchdown area and continue laterally onto the fuel drum. The pilot was wearing his helmet; however, the severity of the impact caused the helmet to fail around the side where the shell had been cut away to accommodate the headphone earpiece. A full-shell helmet, which has the earpiece inside the shell, would have been structurally stronger and afforded better protection.

Finding as to causes and contributing factors

1. The helicopter crashed due to a dynamic rollover that resulted from the landing gear skid contacting the fuel pump that was projecting from the top of a fuel drum. It could not be determined why the helicopter struck the fuel pump/drum.

Findings as to risk

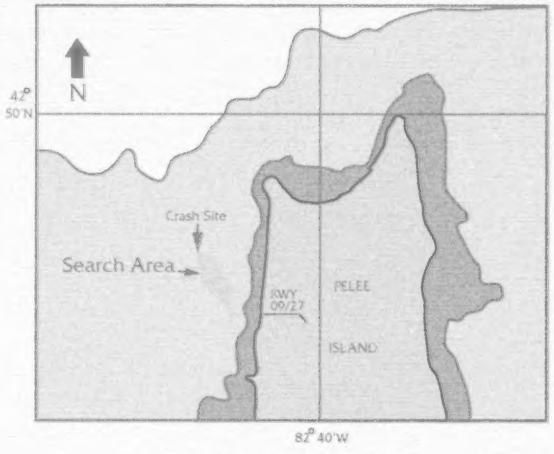
1. The pilot's open-earpiece type helmet did not provide the level of side impact protection that a full-shell type helmet would have, and this may have contributed to the severity of the injuries.
2. The operation of a helicopter at or below minimum fuel levels is conducive to unporting, which may result in a sudden loss of power at a crucial moment.

Safety action taken

The operator has advised its pilots not to purchase or utilize the older military style of open-earpiece helmets, since the open-earpiece type helmet does not provide the level of side-impact protection that a full-shell type helmet would provide. As a result of this investigation indicating unporting as a risk, the operator has issued a memo to all flight crews mandating a minimum indicated fuel load of 15 U.S. gallons during all Bell 206 operations.

TSB Final Report A04H0001—Loss of Control

On January 17, 2004, a Cessna 208B Caravan was on a flight from Pelee Island, Ont., to Windsor, Ont., with one pilot and nine passengers on board. The aircraft took off from Runway 27 at approximately 16:38 Eastern Standard Time and used most of the 3 300-ft runway for the take-off run. It then climbed out at a very shallow angle while turning north over the frozen surface of Lake Erie, toward Windsor. The aircraft struck the surface of the lake approximately 1.6 NM from the departure end of the runway. All 10 persons on board were fatally injured.



Map of crash location

Findings as to causes and contributing factors

1. At takeoff, the weight of the aircraft exceeded the maximum allowable gross take-off weight by at least 15 percent, and the aircraft was contaminated with ice. Therefore, the aircraft was being flown significantly outside the limitations under which it was certified for safe flight.
2. The aircraft stalled, most likely when the flaps were retracted, at an altitude or under flight conditions that precluded recovery before it struck the ice surface of the lake.

3. On this flight, the pilot's lack of appreciation for the known hazards associated with the overweight condition of the aircraft, ice contamination, and the weather conditions was inconsistent with his previous practices. His decision to take off was likely adversely affected by some combination of stress and fatigue.

Findings as to risk

1. Despite the abbreviated nature of a September 2001 audit, the next audit of the operator was not scheduled until September 2004, at the end of the 36-month window.
2. The internal communications at Transport Canada did not ensure that the principal operations inspector responsible for the air operator was aware of the Pelee Island operation.
3. The standard passenger weights available in the *Aeronautical Information Publication* (A.I.P.) at the time of the accident did not reflect the increased average weight of passengers and carry-on baggage resulting from changes in societal-wide lifestyles and in travelling trends.
4. The use of standard passenger weights presents greater risks for aircraft under 12 500 lbs than for larger aircraft due to the smaller sample size (nine passengers or less) and the greater percentage of overall aircraft weight represented by the passengers. The use of standard passenger weights could result in an overweight condition that adversely affects the safety of flight.
5. The Cessna Caravan de-icing boot covers up to a maximum of 5 percent of the wing chord. Research on this wing has shown that ice accumulation beyond 5 percent of the chord can result in degradation of aircraft performance.
6. At the Pelee Island Airport, the air operator did not provide the equipment that would allow an adequate inspection of the aircraft for ice during the pre-flight inspection and did not provide adequate equipment for aircraft de-icing.
7. Repetitive charter operators are not considered to be scheduled air operators under current Transport Canada regulations, and, therefore, even though the charter air operator may provide a service with many of the same features as a scheduled service, Transport Canada does not provide the same degree of oversight as it does for a scheduled air operator.
8. A review of the *Canadian Aviation Regulations* (CARs) regarding simulator training requirements indicates that there is no requirement to conduct recurrent simulator training if currency and/or pilot proficiency checks (PPC) do not lapse.
9. *Commercial Air Service Standard* 723.91(2) does not clearly indicate whether there is a requirement for simulator training following expiration of a PPC.
10. Incorrect information on the passenger door placards, an incomplete safety features card, and the fact that the operating mechanisms and operating instructions for the emergency exits were not visible in darkness could have compromised passenger egress in the event of a survivable accident.
11. The dogs being carried on the aircraft were not restrained, creating a hazard for the flight and its occupants.

Safety actions taken
(The following are only a selection of the major safety actions taken)

Operator

- The operator installed an aircraft de-icing machine on Pelee Island immediately following the accident.
- The company now employs a second crew member on all passenger flights.
- In an effort to reduce perceived mission pressure on aircraft captains, the chief pilot now reviews the weather each day to forecast delays or cancellations.
- The chief pilot is reviewing every flight plan to verify that the weight and balance program is being followed.

Transportation Safety Board of Canada (TSB)
The TSB identified risks associated with using standard weights, and issued two aviation safety recommendations:

The Department of Transport require that actual passenger weights be used for aircraft involved in commercial or air taxi operations with a capacity of nine or fewer passengers.
(A04-01)

and

The Department of Transport re-evaluate the standard weights for passengers and carry-on baggage and adjust them for all aircraft to reflect the current realities.
(A04-02)

Transport Canada
In response to A04-01, Transport Canada indicated that it continues to review the standards, and that one of the options under consideration is to require the use of

actual passenger weights. The TSB feels the present risks associated with using standard weights will remain until a new standard is put in place to ensure that actual weights are used for aircraft carrying nine passengers or less.
In response to A04-02, Transport Canada re-evaluated the standard weights for passengers and carry-on baggage and, effective January 20, 2005, adjusted them for all aircraft to reflect current realities, and amended the guidance material.

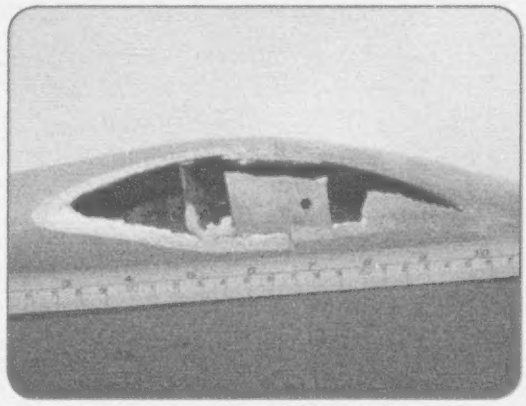
The Federal Aviation Administration (FAA)
The FAA released a comprehensive guide that provides air operators of large, medium, and small cabin aircraft with options for calculating passenger weights, to reflect current realities.

The FAA issued *Airworthiness Directive* (AD) 2005-07-01, effective March 29, 2005, and subsequently issued AD 2006-06-06, effective March 24, 2006, which supersedes AD 2005-07-01. The AD was the result of several accidents and incidents involving the Cessna 208 and 208B operating in icing conditions. The purpose of the AD is to ensure that pilots have enough information to prevent loss of control of the aircraft while in flight during icing conditions. The AD is applicable to Cessna 208 aircraft in Canada. For the most accurate and current information, consult: www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAD.nsf/MainFrame?OpenFrameSet.

On March 24, 2006, TC issued Service Difficulty Alert 2006-01R2,—Cessna 208 (Caravan) Series-Operation Into Known or Forecast Icing Conditions —*which addresses the FAA AD and which makes further recommendations to Canadian Cessna Caravan C208 operators. For details consult*: www.tc.gc.ca/CivilAviation/certification/continuing/Alert/2006-01.htm. *Readers are encouraged to read the full report of this major investigation on the TSB Web site. —Ed.*

TSB Final Report A04A0057—Wing Scrape During a Rejected Landing

On May 28, 2004, a Boeing 727-225 freighter was on a night cargo flight from Hamilton, Ontario, to Moncton, New Brunswick. The first officer was performing the pilot flying (PF) duties, and the captain was conducting a line check on the first officer. The en route portion of the flight to Moncton was uneventful. On arrival at Moncton, the flight crew conducted two unsuccessful approaches in darkness and poor weather conditions before landing on the third approach. A post-flight inspection of the aircraft in Moncton found visible damage on the left wing. The tip of the left outboard leading edge flap and the outboard trailing edge flap "canoe" were abraded. The damage was consistent with a slight contact with the runway. Available information indicates that the wing scrape occurred at 02:41 Atlantic Daylight Time during the rejected landing after the second approach. The aircraft was at a pitch angle of 5° nose up, 14° of left bank, and a derived aircraft height above ground of approximately 26 ft. There were no injuries.



Close-up photograph of left outboard leading edge flap damage

Findings as to causes and contributing factors
1. The captain's decision to intervene and reject the landing on the second approach was too late to prevent the aircraft from contacting the runway surface.
2. The aircraft's wings were not leveled until after the nose was raised, resulting in the ieft wing contacting the runway.

Finding as to risk
1. The forecasted deteriorating weather was not detected or reported in a timely manner.

Other findings
1. The aircraft landed with less than the minimum diversion fuel required in the *Flight Operations Manual* (FOM); however, the decision to carry out the third approach could be considered reasonable in the circumstances faced by the captain.
2. The weather conditions reported to the crew were not representative of the actual weather conditions at the airport. This contributed to the planning errors made by the crew and the unnecessarily low fuel state.

Safety action taken
The section dealing with minimum required diversion fuel in the operator's FOM has been amended. The amended version reads as follows:

"Upon reaching MIN DIV fuel, the flight MUST proceed immediately to the alternate airport."

Transport Canada is proposing changes to the *Canadian Aviation Regulations* that will define the use of pilot-monitored approaches as part of the new approach ban regulations.

In response to this occurrence, Transport Canada regional staff conducted an inspection of the weather observation service at Moncton on October 5, 2004. As a result of the findings, the flood lights near the ceiling projector were adjusted to reduce interference with weather observations, and NAV CANADA has implemented new procedures to improve the communication of information related to changing weather conditions between the weather office and the tower personnel.

TSB Final Report A04P0240—Blade Strike and Rollover

On June 25, 2004, at 20:20 PDT, the pilot of a Eurocopter AS350 B2 (Astar) helicopter landed on a recently prepared mountainside helipad, 5 NM west of the extinct Flourmill Volcano, B.C., at 5 200 ft elevation. With the helicopter still running at flying rotor rpm and light on the skids, four passengers boarded with a small amount of personal equipment and prepared for takeoff. The pilot increased collective pitch to bring the helicopter into the hover, but the engine parameters were approaching their limits, and he discontinued the takeoff and lowered the collective. The left rear passenger got out, and the pilot again raised the collective, lifting the helicopter into a stable 5-ft hover over the pad. Satisfied this time with the engine readings, the pilot increased collective pitch and climbed to approximately 20 ft while purposely allowing the nose to swing to the left to turn downhill for the transition into forward flight.

As the helicopter turned through 100° of left turn, the low rotor rpm warning horn sounded, and the pilot decided to return to the pad. He allowed the left turn to continue but, by the time the helicopter returned to the original heading, it had drifted approximately 20 ft downhill from the pad and was still descending. The main rotor blades

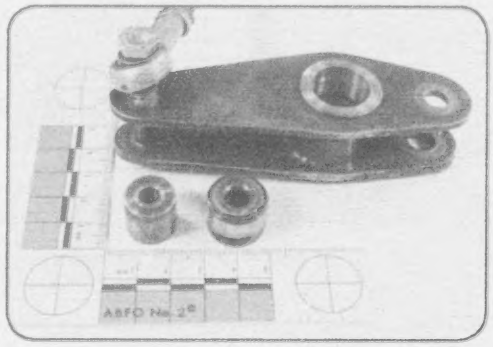
then struck a large tree stump adjacent to the pad and the helicopter rolled over, coming to rest on its left side, almost inverted. The three passengers quickly escaped from the helicopter, but the pilot delayed his exit to shut down the engine, which had continued to run. After he had secured the engine, fuel valve, and electrical switches, the pilot exited the cockpit. The four occupants received minor injuries, and the helicopter was substantially damaged. The emergency locator transmitter (ELT) activated automatically at rollover. There was no fire.

Findings as to causes and contributing factors

1. The helicopter climbed vertically out of the hover at near-maximum gross weight, it encountered down-flowing air, which resulted in a situation in which there was insufficient power to maintain controlled flight. As a result, the rotor rpm decayed rapidly, and the helicopter descended in an overpitched condition until it struck the terrain.
2. The physical characteristics of the landing area did not allow a successful landing following the rotor rpm decay and uncommanded descent.

TSB Final Report A04C0174—Landing Gear Collapse and Runway Excursion

On September 21, 2004, a Metro III aircraft departed Stony Rapids, Sask., with two crew members and nine passengers on a day, visual flight rules (VFR) flight to La Ronge, Sask. On arrival in La Ronge, at approximately 14:10 Central Standard Time (CST), the crew completed the approach and landing checklists and confirmed the gear-down indication. The aircraft was landed in a crosswind on Runway 18 and touched down firmly, approximately 1 000 ft from the threshold.



Bellcrank assembly with a part number 5453032-1 roller on the left and a YCRS-12 bearing on the right

On touchdown, the left wing dropped and the propeller made contact with the runway. The aircraft veered to the left side of the runway, despite full rudder and aileron deflection. The crew applied maximum right braking and shut down both engines. The aircraft departed the runway

and traveled approximately 200 ft through the infield before the nose and right main gear were torn rearwards; the left gear collapsed into the wheel well. The aircraft slid on its belly before coming to rest approximately 300 ft off the side of the runway. Three of the passengers suffered minor injuries from the sudden stop associated with the final collapsing of the landing gear; the other passengers and the pilots were not injured.

Findings as to causes and contributing factors

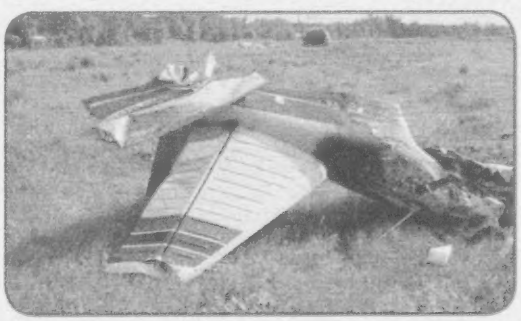
1. An incorrect roller of a smaller diameter and type was installed on the left main landing gear outboard bellcrank assembly, contrary to company and industry practice.
2. The smaller diameter roller reduced the required rigging tolerances for the bellcrank-to-cam assembly in the down-and-locked position, and allowed the roller to eventually move beyond the cam cutout position, resulting in the collapse of the left landing gear.
3. A rigging check was not carried out after the replacement of the bellcrank roller. Such a check should have revealed that neither the inboard nor outboard bellcrank assembly met the minimum rigging requirements for proper engagement with the positioning cam.

Safety action taken

After the occurrence, the operator commissioned an independent safety audit of its complete operation. All maintenance staff of the approved maintenance organization (AMO) responsible for this operator met to review the company's maintenance procedures outlined in its maintenance policy manual. The following policy was reinforced: "No one is to install any parts on any aircraft without first referring to the appropriate parts and service manuals to ensure correct part number and also that the integrity of the affected aircraft system is still in place."

TSB Final Report A04C0162—Flight Into Adverse Weather—Collision with Terrain

On August 26, 2004, a Piper PA-28-235 aircraft departed Roblin, Man., at 20:25 Central Daylight Time on a VFR flight to Gimli, Man. The initial portion of the flight was in daylight, the latter portion at night. The flight took place in uncontrolled airspace, and there was no record of any communication with air traffic services (ATS) during the flight. The aircraft crashed in an open field at 21:40. The pilot, the sole occupant of the aircraft, sustained fatal injuries, and the aircraft was destroyed by the impact and a post-impact fire.



Findings as to causes and contributing factors

1. The pilot continued a series of VFR flights at night into an area of limited surface lighting with known adverse weather conditions.
2. The pilot's instrument flying skills were most likely not adequate to safely complete the course reversal turn, resulting in an inadvertent descent that was not detected and corrected in time to prevent impact with the surface.

Finding as to risk

1. The pilot did not ensure that the responsible person who received the flight itinerary understood the search and rescue (SAR)-notification requirements.

Safety action taken

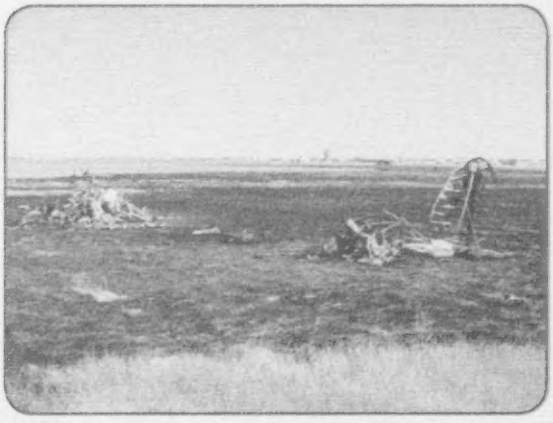
On January 25, 2005, the TSB sent a safety advisory to Transport Canada, suggesting that the department may wish to consider action to improve awareness among pilots of the need to ensure that persons responsible for flight itineraries understand their obligations concerning SAR notification. An article was published in issue 2/2005 of the *Aviation Safety Letter*, which is sent to all Canadian licensed pilots. The article summarized the occurrence and emphasized the need for pilots to ensure that persons responsible for the flight itinerary fully understand the SAR-notification requirements.

TSB Final Report A05C0123—In-Flight Collision During Air Show

On July 10, 2005, three aircraft were engaged in a simulated dogfighting display at Moose Jaw/Air Vice Marshal C.M. McEwen Airport as part of the Saskatchewan Air Show. The display team consisted of three biplane aircraft: a Waco UPF-7 87, a Wolf-Samson and a Pitts Special. A ground display featuring a jet-powered truck was part of the act. At approximately 16:17 Central Standard Time (CST), the three biplanes were performing a series of crosses and chases in a simulated dogfight scenario. As the jet-powered truck moved into position on the 500-ft show line, the three biplanes entered a manoeuvre called "The Dairy Turn" in preparation for a series of crosses centered on the truck. During the manoeuvre, the Waco and the Wolf-Samson collided near show centre at about the 1 500-ft show line. Both biplanes caught fire and crashed between the 1 500-ft show line and the outer runway. Both pilots were

killed on impact, and both aircraft were destroyed. All debris fell away from the crowd toward the outer runway. Immediate implementation of emergency procedures kept spectators from moving toward the burning wreckage.

The Dairy Turn is a scripted manoeuvre, with the intention to create the illusion of a close call as two of the three aircraft cross near show centre, also involving the jet-powered truck for visual effect. Other display team members understood that the contract for safe separation required the pilots to establish visual contact with each other at specific location of the manoeuvre and maintain separation visually. One of the aircraft had been late on its track on occasions since the display had been developed. This lateness had not previously caused any difficulties for the performers. The manoeuvre had been recently modified. Whether the contract for safe separation was also revised could not be established.



Charred remnants of the air demonstration aircraft

Findings as to causes and contributing factors

1. The Dairy Turn manoeuvre had been modified such that a temporary loss of visual contact could occur immediately before the aircraft crossed flight paths. This modification made timing critical and added two potential points of collision.
2. The manoeuvres immediately before the collision indicated that the performers had not established a clearly understood contract for the revised manoeuvre. The actions of each performer negated the actions of the other, and neither pilot took positive action to regain visual contact.
3. The timing of the manoeuvre was lost when the Waco turned late at show centre.

Finding as to risk

1. The sequential manoeuvre information provided to Transport Canada was not detailed enough to allow a thorough review of the energy management of the display.

TSB Final Report A05Q0157—Flight into Adverse Weather—Collision with Terrain

On September 1, 2005, a float-equipped de Havilland DHC-2 Beaver departed the outfitter base camp at Squaw Lake, Que., at 09:25 EDT, with a passenger and a few supplies on board, for a round-trip VFR flight to two wilderness camps, Camp 2 and Camp Pons. The weather in Squaw Lake was suitable for visual flight at the time of takeoff, but was forecast to deteriorate later in the day.

The pilot completed the flights to the two camps, and on the way back to Squaw Lake, the weather forced the pilot to make a precautionary landing on Elross Lake, 15 NM northwest of Squaw Lake. At 16:30, he reported to the company via high frequency (HF) radio that he intended to take off from Elross Lake, as there seemed to be a break in the weather. Rescue efforts were initiated in the evening when the aircraft did not arrive at the base camp. The aircraft was located at 12:30 the following day, 4 NM from Elross Lake. The aircraft was destroyed by a post-impact fire. The pilot sustained fatal injuries.

Finding as to causes and contributing factors

1. The pilot attempted to cross the mountain ridge in adverse weather, and the aircraft stalled at an altitude from which recovery was not possible. Loss of visual references, strong updrafts, moderate to severe turbulence and possible wind shear likely contributed to the onset of the aerodynamic stall.

Other finding

1. Had this been a survivable accident, rescue efforts may have been compromised by a lack of communication. A satellite phone provides a more effective means of communication when in remote areas.

Safety action taken

On March 3, 2006, the TSB sent a safety information letter to Transport Canada, highlighting the criticality of flight following communication as it relates to SAR response in remote areas of the country, and indicating the effectiveness of alternate means of communication, such as satellite phones. △

THINK WINTER FLYING!

ACCIDENT SYNOPSES

Note: All aviation accidents are investigated by the Transportation Safety Board of Canada (TSB). Each occurrence is assigned a level, from 1 to 5, which indicates the depth of investigation. Class 5 investigations consist of data collection pertaining to occurrences that do not meet the criteria of classes 1 through 4, and will be recorded for possible safety analysis, statistical reporting, or archival purposes. The narratives below, which occurred between February and April 2006, are all "Class 5," and are unlikely to be followed by a TSB Final Report.

— On February 2, 2006, a Robinson R44 II helicopter was operating from the PenWest Mega Gas Plant, located approximately 40 NM south of Rainbow Lake, Alta. The pilot was manoeuvring the aircraft to refuel before commencing sling operations, when the main rotor blades came into contact with the fuel tank. The aircraft sustained substantial damage to the main rotor blades and power train. The fuel storage tank sustained damage and was reported as leaking. There were no injuries.
TSB File A06W0023.

— On February 7, 2006, a privately-owned Piper PA-34-200 (Seneca II), was low on approach to Runway 26L at Pitt Meadows, B.C., airport. The aircraft struck several approach lights and a fence before coming to rest approximately 200 ft short of the runway threshold. The aircraft was substantially damaged, but the pilot was uninjured. *TSB File A06P0018.*

— On February 9, 2006, a privately-registered PA-46 Malibu was landing on Runway 33 at London, Ont. During the touchdown, the aircraft suddenly veered to the left. The pilot attempted to control the aircraft by applying right rudder and brake, but the aircraft departed the runway surface approximately 2 500 ft from the threshold. During the runway excursion, the left main gear and the nose gear collapsed, resulting in substantial damage to the aircraft. The runway condition report, taken approximately 35 min after the occurrence, was 50 percent bare and dry, 40 percent trace of snow and 10 percent ice. The runway friction index was 0.63. There were no injuries. *TSB File A06O0036.*

— On February 12, 2006, a Cessna 172N with only a student-pilot on board, was conducting a flight from St-Frédéric, Que., to Montmagny, Que. While en route the aircraft flew over a lake at low altitude, and the left wing hit some trees. The pilot continued the flight and conducted a touch-and-go at Montmagny before returning to St-Frédéric, where the aircraft landed without incident. The aircraft's left wing leading edge was damaged. The aircraft will be repaired before being returned to service. *TSB File A06Q0026.*

— On February 18, 2006, a Cessna A185F, with only the pilot on board, was conducting a landing on Lac Sept-Îles, Que. The aircraft was equipped with skis and retractable wheels. Upon landing, the aircraft slid approximately 200 ft before the left ski broke through the crust of the snow. The aircraft nosed over, and came to a stop on its back. Before taking off, the pilot inspected the lake surface by riding up and down it on a snowmobile, and decided it was suitable for landing.
TSB File A06Q0031.

— On February 24, 2006, the pilot of an amateur-built Mustang P51D70 tail dragger aircraft was on the runway performing taxi tests, when directional control was lost, the aircraft veered off the left side of the runway, and struck a ditch. The landing gear collapsed and the aircraft was substantially damaged. There were no injuries to the pilot. *TSB Report A06O0045.*

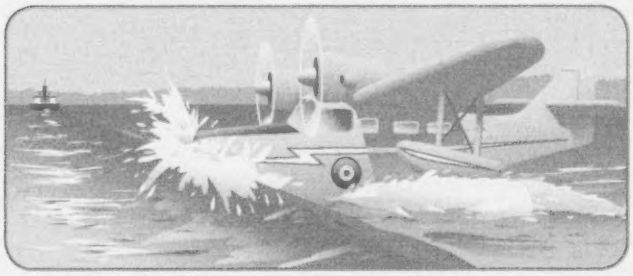
— On March 5, 2006, a ski-equipped de Havilland DHC-6-100 Twin Otter had been parked overnight on the apron at La Ronge, Sask. The aircraft was stuck to the snow-covered apron, and at the start of taxiing, the skis broke free and the aircraft abruptly began moving forward. The aircraft struck a parked DHC-2 Turbo Beaver and a parked vehicle. The Twin Otter sustained substantial damage to the nose cone, nose landing gear, both engines and propellers, and the fuselage. The Turbo Beaver sustained substantial damage to the right wing, and the vehicle also sustained substantial damage. No injuries occurred. *TSB Report A06C0041.*

— On March 5, 2006, an amateur-built Murphy Rebel, with the pilot and one passenger on board, was flying from Brampton, Ont., to the pilot's cottage on Sturgeon Lake, Ont. The pilot was landing the wheel-equipped aircraft on the snow-covered lake, and misjudged the depth of snow. On touchdown, the aircraft nosed over and came to rest inverted. The pilot received minor injuries, and the aircraft was substantially damaged.
TSB Report A06O0060.

— On March 19, 2006, an MD 369 helicopter descended into a confined area below tree line in order to drop off an item to a ground crew member. While trying to drop off the item, the pilot took his hand off the collective, the aircraft drifted off to the right, making contact with the top of a tree and severing part of the tail boom. Upon loss of tail rotor authority, the helicopter yawed to the right, and the tail boom struck another tree and then proceeded

to spin out of control several times. The helicopter fell from approximately 25 to 30 ft and spun to the ground, finally landing on the pilot side. The pilot was not injured. *TSB Report A06P0055.*

— On March 24, 2006, a Grumman Goose G-21A was damaged on landing in Hardy Bay, Port Hardy, B.C. The aircraft had landed in a large bow wake created by a boat. The operator grounded the aircraft after maintenance identified upper wrinkles in the skin above the front windows and bent engine mounts. *TSB Report A06P0044.*



Artist's impression of aircraft landing on bow wake

— On March 28, 2006, a Bellanca 7GCBC aircraft, with the pilot and one passenger on board, departed Pilgram Lake, Ont., for a return to the pilot's home strip. The pilot stopped to refuel near Wades Landing on Lake Nipissing, Ont. While taxiing on the frozen lake surface, the front wheels broke through the ice. The aircraft nosed over and came to rest upside down. The pilot and passenger were not injured. There was substantial damage to the aircraft. *TSB Report A06O0077.*

— On April 1, 2006, a Mooney M-20F aircraft departed the Steinbach, Man., airport for a pleasure flight with the pilot and one passenger on board. During final approach for Runway 14, the aircraft landed with the landing gear retracted. The pilot and passenger evacuated the aircraft without injury; the aircraft sustained substantial damage. *TSB Report A06C0039.*

— On April 1, 2006, a Cessna 177 aircraft departed Trail, B.C., for a VFR flight to Revelstoke, B.C., with the pilot and two passengers on board. The fuel gauges showed the tanks to be just under 3/4 full. The aircraft was not refuelled at Revelstoke, and the flight departed for Trail with the fuel gauges showing just under 1/2 full. On the return flight, a headwind and cloud were encountered, which forced the aircraft to be flown at a lower altitude and on an indirect route because of terrain. Since it appeared that the aircraft did not have enough fuel to reach Trail, a diversion to Castlegar, B.C., was attempted. About 11 NM north of the Castlegar airport, the engine stopped from fuel starvation. The pilot set up for a forced landing, but during the approach to his chosen field, the aircraft stalled and landed hard, breaking the right main wheel and sustaining substantial damage. The pilot sustained minor injuries, and the passengers were uninjured. *TSB Report A06P0046.*

— On April 4, 2006, a Beech 200 was conducting a flight between La Romaine (CTT5) and Natashquan (CYNA), with two crew members on board. While the aircraft was en route, at an altitude of 2 000 ft, the main door detached from the aircraft. Given the short distance between the two airports, the crew decided to continue on to Natashquan. The aircraft landed without incident. The door had not been locked properly before departure. *TSB File A06Q0060.*

— On April 7, 2006, an AS 350 B1 helicopter had dropped off six skiers atop a 5 500-ft mountain, and was descending at about 2 000 ft/min toward a landing area at about 1 800 ft. When the pilot began to pull in collective pitch to arrest the rate of descent prior to landing, the engine began to loose power and the low rotor rpm warning horn began to sound. The helicopter descended past the intended landing site to an unobstructed area about 150 ft further down the mountain, where it landed hard on snow-covered ground. The main rotors severed the tail boom, and one main rotor blade was shed. After exiting the aircraft, the pilot noted the engine was smoking heavily and extinguished it using a hand-held extinguisher and snow. The engine exhaust stack was damaged from the inside, and contained metal debris. *TSB Report A06P0051.*

— On April 19, 2006, a DHC3 on skis inbound from Chibougamau, landed on the ice runway at Lac Lagopède. During the landing roll, the aircraft was unable to stop in time, and struck another DHC3, which was parked on the runway, with the engine shut down. The left wing leading edge of the first DHC3 was substantially damaged. The right wing of parked DHC3 was ripped off in the collision. None of the occupants of either aircraft was injured. *TSB File A06Q0070.*

— On April 24, 2006, a Robinson R44 helicopter was preparing to depart from Terrace, B.C. The engine was running, and the rotor was turning while a second company pilot was loading fuel containers into the cargo compartment. The pilot-in-command, who was the only person on board, got out of the helicopter to help with the loading. While the pilot was outside, the helicopter began to lift off, rolled onto its left side, and collided with the ground. There was substantial damage to the helicopter, but no injuries or fire. *TSB Report A06P0064.* △

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Near Repeat of Mirabel De-Icing Mishap

The following is a summary of an incident in the central de-icing facility (CDF) at the Macdonald Cartier International Airport (CYOW) in Ottawa, Ont., and was graciously provided by the CDF management team, which did its own investigation with hopes of preventing a reoccurrence. It brings back memories of the January 21, 1995, Mirabel, Que., tragedy, when a Boeing 747 departed the de-icing facility early and three de-icing operators in the cherry-pickers were killed when their baskets were tipped to the ground by the large aircraft. The Mirabel report can be found on the TSB Web site as file A95Q0015. —Ed.

On December 7, 2005, a Regional Jet CL600 was being de-iced in the CDF at CYOW, in preparation for a scheduled flight, with both engines operating. Two de-icing vehicles were in position at the tail of the aircraft, one on each side of the aircraft with booms raised and in the process of de-/anti-icing. The flight crew reported hearing that the flight was "clear." A request was made to ICEMAN (the CDF coordinator) for departure instructions. ICEMAN issued departure instructions to the flight crew. The aircraft exited the de-icing bay and proceeded on the west taxilane. The horizontal stabilizers of the aircraft narrowly missed contacting the de-icing vehicle booms. The de-icing vehicles and persons in the buckets of the booms did experience "jet blast." There were no injuries to the individuals in the buckets or damage to the de-icing vehicles.

Before departure, the flight crew was instructed to taxi to the CDF and contact ICEMAN on frequency 122.925. At 16:06 Eastern Daylight Time (EDT), the flight was positioned in a de-icing bay where two de-icing vehicles were waiting, and was instructed to contact SNOWMAN (the de-icing crew) on 131.075. Communications between the captain and SNOWMAN established that the aircraft was configured for de-icing operations. The operation was commenced, and the vehicle operators communicated with each other on 131.075.

At 16:21 EDT, the flight crew contacted ICEMAN to inform him that de-icing was complete, and to request departure instructions. After requesting, and receiving, verbal confirmation from the flight crew that all staff and equipment were away from the aircraft, ICEMAN gave departure instructions to the flight crew, to exit the CDF (via xyz route), and to contact ground control on 121.90. The aircraft proceeded as instructed. At that time, the de-icing vehicles were de-icing the horizontal stabilizers, positioned on either side of, and perpendicular to, the fuselage, and forward of the horizontal stabilizers. Immediately after this, ICEMAN was contacted by one of the de-icing vehicles, informing him that de-icing had not been completed and that both vehicles were de-icing the tail of the aircraft at the same time it had exited Bay 4.

The flight crew reported that SNOWMAN communicated to them: "Your holdover times started 30 seconds ago. You are clear." After receiving a confirmation of de-icing fluid mixtures from SNOWMAN, the flight crew also reported hearing SNOWMAN reaffirm: "You are clear, contact ICEMAN on 122.92 for taxi." In addition, the flight crew reported seeing SNOWMAN give a wave with his left hand, followed by a departure of the de-icing vehicle from the area. The flight crew reported looking left and right to confirm the area around the aircraft was clear. Subsequently, the flight crew requested, and received, departure instructions from ICEMAN. At the time of these transmissions, the elapsed time since the beginning of the operation matched the time usually required for this kind of de-icing operation.

Above anything else, de-icing operations require clear and precise communications between all involved

The de-icing staff reported that they received a request from the flight crew regarding fluid mixtures, and reported also that the phrase "you are clear" was used during the de-icing operation. While the phrase "you are clear" is part of the communication standard operating procedures (SOP) for de-icing operations, it could not be determined at what time during the de-icing operation this had occurred. Other than the factual history details, the de-icing staff said this was the only reported communications between them and the flight crew.

Immediately after this, the aircraft engines were heard to increase thrust and the aircraft began to move forward, exiting Bay 4.

Analysis
The VHF radios in the aircraft and de-icing vehicles functioned normally; however, there was confusion in communications between the flight crew and SNOWMAN that resulted in the captain believing that the de-icing was completed.

Decision to taxi
According to the International Civil Aviation Organization (ICAO), the following information must be given to the flight crew on completion of de-icing: the type of fluid used, the time of the last application, and confirmation that the aircraft complies with the clean aircraft concept. The flight crew released the brakes under the assumption that this information had been received. The flight crew reported hearing the words "you are clear" (de-icing completed). Although this message was not preceded by the flight call-sign or the de-icing crew call-sign, the flight crew reported hearing "you are clear" twice. The duration of the operation up to that point matched the time usually required for this type of de-icing. In addition, the flight crew reported seeing a wave of a hand from SNOWMAN and subsequently, the vehicle departing the vicinity of the aircraft. The flight crew assumed the de-icing crew had left the frequency and departed the area. The flight crew then advised the ICEMAN that the aircraft was ready to taxi, and, in doing so, conveyed to the ICEMAN that de-icing was completed and the aircraft was free of obstruction. Relying on that information, ICEMAN indicated to the flight crew their assigned route for taxiing. The flight crew further interpreted the issuance of taxi instructions as confirmation that the aircraft was free of obstructions.

Standard phraseology
According to the rules of standard phraseology, to avoid confusion, radio messages must be preceded by the receiving station call-sign, followed by the sending station call-sign. While these rules may not apply to interphone communications, the "open" nature of VHF radio communications requires that the international rules of radio procedure be followed. In this case, the flight crew reported hearing the words "you are clear" and made a number of erroneous assumptions: that the radio transmission was directed at them; that the de-icing operation was completed; and that all equipment and personnel were away from the aircraft's taxi path.

Coordination of communications
During de-icing operations, the operators of both de-icing vehicles communicated with each other on 131.075, and also with the flight crew on that same frequency; this allowed the flight crew and the de-icing staff to become confused during conversations.

Control of de-icing area
The CDF coordinator (ICEMAN) performed his tasks in accordance with established procedures and his assigned responsibilities. He guided the aircraft until it was stopped at its de-icing position. The aircraft came fully under the responsibility of the captain after it was stopped for de-icing. Before issuing taxi instructions to the aircraft, ICEMAN verified that the taxiway was clear. It was not his responsibility to consult the flight crew and de-icing personnel to determine whether de-icing of the aircraft was complete and the aircraft was ready to taxi. That responsibility was assumed by the flight crew when they declared the aircraft ready to taxi.

The fact that ICEMAN issued taxi instructions when de-icing was not completed indicates that he was not aware that de-icing was in progress. Although he fully discharged his responsibilities, ICEMAN probably did not have enough information or sufficient tools to accurately assess the situation in the CDF.

Marshaller
SNOWMAN performed the duties of marshaller and truck driver. He was not in a position to prevent the aircraft from advancing, given that he was behind the aircraft. In addition, SNOWMAN was not monitoring the ICEMAN VHF frequency of 122.925.

Several air carriers prefer to place a marshaller in front of the aircraft to minimize the possibility of the aircraft moving until the de-icing procedure is complete and all personnel and equipment are safely out of the way. Some carriers utilize an interphone cord plugged into the aircraft to maintain constant communication between the ground crew and the flight deck. This procedure eliminates the risk of confusion between flight crew/marshaller communications and other VHF communications. The de-icing contractor had not chosen the direct interphone cord method of communication because it was felt that the area around the aircraft was too dangerous an environment in light of the slippery footing conditions due to the glycol, particularly with the engines running.

Coordination between flight crew and flight attendants
The pilots did not report consulting with the cabin crew before releasing the brakes. Given that the pilots could not see the aft section of the aircraft from the flight deck, and they did not see if the de-icing vehicles had in fact departed the area, consulting the flight attendants was

a conceivable and reasonable option in this particular situation.

In summary, it was determined that the flight crew started to taxi the aircraft before its perimeter was free of obstruction, following confusion in the radio communications.

Findings

- The flight crew and de-icing staff did not use standard aeronautical terminology and phraseology on some occasions.
- The flight crew assumed that the reported message SNOWMAN "you are clear" meant that the de-icing was completed.
- The line of sight from the flight deck of the tail section did not allow the flight crew to be certain if the de-icing vehicles were away from the aircraft in the vehicle safety zones.
- ICEMAN does not have a line of sight of the entire CDF at all times.
- Following confusion in the radio communications, the flight crew started to taxi the aircraft before its perimeter was free of obstructions.
- SNOWMAN was not in a position to prevent the aircraft from advancing, given that he was behind the aircraft where he could not be seen by the flight crew.
- Several air carriers favour having a marshaller in front of the aircraft and using the interphone for ground communications during de-icing. This de-icing operator uses the VHF radio to communicate with the flight crew during de-icing operations.

Safety action taken

Clear communications between flight crews and de-icing staff was the key recommendation. All de-icing providers and all aircraft operators must review procedures with a focus on communication: protocols, practices and phraseology to be used. In particular, there should be an exclusion of the word "clear." Furthermore, the investigation recommended that radio communications between staff of de-icing operators be conducted on a separate, discrete frequency from the frequency used to communicate with the flight crew.

The CDF management team reviewed and made changes to the CDF SOPs. The procedures indicate that both visual and verbal communication must be received and acknowledged by aircraft flight crew prior to exiting CDF. These revised CDF procedures have been provided to all contract carriers, both at the local base and head office levels. △

Cold Weather Altimeter Error—Getting Cold Feet?

by John Tomkinson

As happens every year at this time, everyone should be doing a review of their winter operational procedures, and dusting off the cobwebs from a summer of flying in a temperate climate.

Having discussed the coming winter with many fellow pilots and controllers over the past few weeks, I've found a recurring general theme. Nearly everyone can list hazards of icing, winter weather, slippery runways, and additional human factors, but whenever the topic of cold weather altimeter error comes up, I see more long faces than I should. Discussions in online forums show that most individuals have an idea of the implications that cold weather has on altimeter readings, but most can't get all the details correct, so here is our brush-up situation.

Cold weather altimeter error is operationally similar to flying from an area of high pressure to low pressure; the altimeter reads higher than it really is. The degree to which the altimeter misreads must be corrected by the use of charts available in the Transport Canada *Aeronautical Information Manual* (TC AIM) RAC Figure 9.1. Simple really, but there are common misconceptions about this procedure.

Firstly, this and other altimeter corrections are not done by ATC, but are the pilot's responsibility. Radar vectoring altitudes assigned by ATC are, however, already corrected for cold temperatures. This correction is done by airspace planners while establishing all minimum safe altitudes for use by ATC.

Secondly, any correction applied to a published altitude should be relayed to ATC. There is no minimum altitude correction that can be brushed under the carpet. Even the smallest corrections can make a big difference.

Corrections calculated by pilots are to be used to ensure obstacle clearance during final approach fix crossings, procedure turns, or missed approaches.

For those who have never used an altitude correction chart, here is an example of how the Canadian chart works. The minimum safe altitude for our example aerodrome with weather reporting is 3 000 ft, and the field elevation is 1 000 ft; therefore, the height above elevation of altimeter setting is 2 000 ft. The current aerodrome temperature is -30°C. Looking at the Altitude Correction Chart below, find the column representing 2 000 ft above the aerodrome with the row corresponding to -30°C for temperature, and the value required to be added to your altitude is 380 ft. To ensure that a published altitude of 3 000 ft will truly provide obstacle clearance, the altimeter must then be reading 3 380 ft. Additionally, in examples shown in the current TC AIM, the corrected indicated altitude is rounded to the next higher 100-ft increment, so our example would become 3 400 ft.

Sound like a small correction? Is it worth pulling out charts to cross reference while briefing the approach? In an accident report published by the Canadian Aviation Safety Board [now the Transportation Safety Board of Canada (TSB)], the hazards of failing to correct for even the smallest temperature error are clear. Fortunately, there were no fatalities in this incident:

- "The helicopter was dispatched at night, in IFR conditions...The crew descended on the inbound leg to 150 ft, with reference to the pilot's altimeter. The helicopter struck the sea ice and was destroyed by post-impact fire. The crew had not applied a temperature correction to the minimum descent altitude [*approximately 40 ft to as much as 100 ft. —Ed.*], and this omission—combined with the known 50-ft error in the pilot's altimeter—accounted for the mistaken belief the helicopter was higher." (A81W0134)

A combination of high terrain or obstacles and low aerodrome temperature can easily wear down safety margins on your approach. Our above example has an error of 400 ft, meaning we would have *no* terrain clearance if we flew the published altitudes uncorrected.

So how can you know if your feet are cold? The following are the guidelines in the TC AIM.

According to TC AIM RAC Figure 9.1—Altitude Correction Chart:
With respect to altitude corrections, the following procedures apply:

1. IFR assigned altitudes may be either accepted or refused. Refusal in this case is based upon the pilot's assessment of temperature effect on obstruction clearance.
2. IFR assigned altitudes accepted by a pilot shall not be adjusted to compensate for cold temperatures, i.e. if a pilot accepts "maintain 3 000," an altitude correction shall not be applied to 3 000 ft.
3. Radar vectoring altitudes assigned by ATC are temperature compensated and require no corrective action by pilots.
4. When altitude corrections are applied to a published final approach fix crossing altitude, procedure turn or missed approach altitude, pilots should advise ATC how much of a correction is to be applied.

ALTITUDE CORRECTION CHART *(Ref.: TC AIM RAC Figure 9.1)*

	Height above the elevation of the altimeter setting sources (ft)													
Aerodrome Temperature °C	200	300	400	500	600	700	800	900	1 000	1 500	2 000	3 000	4 000	5 000
0	20	20	30	30	40	40	50	50	60	90	120	170	230	290
-10	20	30	40	50	60	70	80	90	100	150	200	290	390	490
-20	30	50	60	70	90	100	120	130	140	210	280	430	570	710
-30	40	60	80	100	120	130	150	170	190	280	380	570	760	950
-40	50	80	100	120	150	170	190	220	240	360	480	720	970	1 210
-50	60	90	120	150	180	210	240	270	300	450	600	890	1 190	1 500

NOTES: 1: The corrections have been rounded up to the next 10-ft increment.
2: Values should be added to published minimum IFR altitudes.
3: Temperature values from the reporting station nearest to the position of the aircraft should be used. This is normally the aerodrome.

Everyone knows the old saying "high to low, look out below." As we enter another winter flying season, let's add another reminder phrase to our repertoire, "hot to cold, don't be so bold." Don't get cold feet in your altimeter this year! △

John Tomkinson is an active air traffic controller in Toronto Center and a private pilot. He is also an aviation staff writer for www.aviation.ca.

Storage, Labelling, Handling and Application of De-/Anti-Icing Fluids in Canada

by Paul A. Johnson, Civil Aviation Safety Inspector, General Aviation, Civil Aviation, Transport Canada

This is a follow-up article to Paul Johnson's "Aircraft Icing for General Aviation…And Others," which was published in the Aviation Safety Letter *(ASL) 3/2005. Some readers asked us to clarify storage, labelling, handling and application of de-icing and anti-icing fluids.*

The *Canada Labour Code* (CLC), Part II, is the legislation that ensures that the health and safety of all employees who are under federal jurisdiction while at work are protected. The *Aviation Occupational Safety and Health Regulations* (AOSHR), Part V, identifies the prescribed standards that must be adhered to with respect to hazardous substances, which include the de-/anti-icing fluids used in conjunction with ground icing operations.

At airports where de-/anti-icing is not available from a service provider, the de-/anti-icing may have to be completed by the pilot. Under these circumstances, pilots either have to carry the required de-/anti-icing fluid on board their aircraft, or purchase it on-site, so they can apply it to the aircraft themselves before takeoff. When the above situation occurs, it is both the operator's and pilot's responsibility to make sure the de-/anti-icing fluid is properly and safely stored, labelled, handled and applied.

Operators and pilots involved in de-/anti-icing operations are to familiarize themselves with the CLC Part II and AOSHR references, with particular emphasis placed on those sections dealing specifically with hazardous substances. In addition, Transport Canada's TP 14052E, *Guidelines for Aircraft Ground Icing Operations*, should be reviewed for recent developments and issues pertaining to aircraft ground icing operations.

The prescribed standards cover everything from the labelling of hazardous substance storage containers (section 5.28), to the requirement that operators must have material safety data sheets (MSDS) on board their aircraft for all hazardous substances an employee may handle or be exposed to, which include de-/anti-icing fluids.
For additional information visit:
www.tc.gc.ca/civilaviation/commerce/circulars/AC0216r.htm

Use only qualified fluids. These are the only fluids that holdover tables relate to. Use of an unqualified fluid risks fire hazards and unknown de-ice/holdover characteristics. For example, Isopropyl alcohol continues to be used as an aircraft de-icing fluid, especially in remote areas; however, it is classified as a flammable dangerous good. Only certain limited quantities may be carried on board an aircraft, and they must be labelled correctly and carried in approved containers. Training must be conducted in accordance with an approved training program and most importantly, no holdover time (HOT) exists. For more info, access:

Transportation of Dangerous Goods (TDG) Information:
www.tc.gc.ca/civilaviation/commerce/dangerousgoods/aboutus.htm

The International Air Transport Association (IATA) *Dangerous Goods Regulations Manual* can be purchased at:
www.iata.org/ps/publications/9065.htm

The International Civil Aviation Organization (ICAO) *Technical Instructions for the Safe Transport of Dangerous Goods by Air* can be purchased at:
www.icao.int/anb/FLS/DangerousGoods/flsdg.cfm

The use of windshield washer fluid, aviation fuel or any other type of non-approved fluid is not recommended. These products have not been tested by any manufacturer and will not guarantee any degree of protection from snow or ice accumulation. Aviation fuel has been known to damage windshields, causing them to turn "milky," not to mention the increased fire risk. An engine stack fire during a cold start could ignite these fuel vapours quickly. Other non-approved fluids can cause damage to rubber seals and paintwork, necessitating expensive repairs.

Recommended de-/anti-icing practices for small aircraft operators
The key for smaller owners/operators regarding de-/anti-icing is prevention. Having a suitable hangar, or wing covers and tail covers, can save time and money when it comes to de-/anti-icing your aircraft. Many owners/operators do not have hangar space, but utilize wing and tail covers in winter to reduce their de-/anti-icing times and expenses. They are great for frost, ice and snow coverage, but can "sweat" under certain atmospheric circumstances, and cause the covers to freeze to the surfaces they are protecting when the temperature drops again. These conditions are rare, and generally the covers are convenient for most small aircraft owners/operators. Installation usually requires two people, but can be done alone with a bit of practice. The covers should come off at approximately the same time. Removing one side and then the other to save time may lead to an accumulation

of frozen contaminants on the side that was exposed to the elements first, and the pilot may not notice, or may fail to recheck for, these contaminants.

In some instances, small aircraft operators carry de-icing fluid on board their aircraft while traveling to remote locations where no de-/anti-icing facilities are available. The fluids carried must be tied down in a suitable location and labelled correctly in a secured container. Most garden-type sprayers are not suitable as a storage container, as they tend to leak from the pressure changes of a flight evolution. This would create a hazardous situation in the aircraft, a slipping risk for the crew, and a potential environmental accident. A recommended practice would be to carry the fluid in an appropriately-secured, labelled container on board the aircraft with an empty garden type sprayer on board as well (or located at the remote destination), and mix the appropriate concentration at the destination, using hot water. If possible, look for a sprayer with an immersible heater that can heat the de-icing fluid to the recommended temperature for application. Remember, it is the heat and spray force that melts the ice. Heated sprayers are available from aircraft supply stores.

Placing de-/anti-icing fluid close to a high heat source, such as a Janitrol heater, creates a fire hazard and is not acceptable. If no such space is available, then sufficient quantities should be made available at away bases.

After de-icing, if anti-icing is required, spray on the correct amount, usually between 1 mm and 3 mm. Do not coat the critical surfaces with too thick a layer, as this may cause aerodynamic problems after takeoff; too thin a layer, and the fluid may not achieve the specified HOT values. The fluid manufacturer will have instructions on proper coverage.

Using a small sprayer to de-ice a larger aircraft, such as a business jet, is not practical. The amount of fluid required to correctly apply de-icing fluid can be quite large. Typically, a small business jet requires 45 to 60 litres (12 to 15 U.S. gallons) or more to de-ice, depending on the amount of frozen contamination to be removed. Using a hand sprayer to apply anti-icing fluid is not recommended either because the time involved would erode valuable HOT. Remember, the HOT starts at the commencement of the anti-icing procedure.

The fluids that have been developed are called Type I, II, III, and IV.

Type I fluid was developed initially, and is used primarily, as a heated de-icing medium. It is also used by smaller aircraft (rotation speeds over 60 kt and ground acceleration times exceeding 16 seconds), for de-/anti-icing; however, the protection is for a short period of time. See *When in Doubt...Small and Large Aircraft—Aircraft Critical Surface Contamination Training for Aircrew and Groundcrew* (TP 10643), Chapter 3, paragraph 42, "Low Speed Test."

Type II fluid was developed as an anti-icing protection, and is still in use today. The thickening properties of this fluid extend HOT compared to Type I fluid; however, its use is intended for aircraft with rotation speeds in excess of 100 kt and ground acceleration times greater than 23 seconds. See *When in Doubt...Small and Large Aircraft—Aircraft Critical Surface Contamination Training for Aircrew and Groundcrew* (TP 10643), Chapter 3, paragraph 41, "High Speed Test."

Type III fluid was developed as an anti-icing fluid similar to Type II fluid; however, its use is intended for aircraft with rotation speeds over 60 kt and ground acceleration times exceeding 16 seconds.

Type IV fluid was developed as an anti-icing fluid similar to Type II fluid but with greater HOT qualities. Its use is also for aircraft with rotation speeds in excess of 100 kt and ground acceleration times greater than 23 seconds.

When spraying to de-/anti-ice your aircraft, confirm that the fluid being used is appropriate for your aircraft type. A check in the pilots operating handbook (POH), aircraft flight manual (AFM), or with the manufacturer, will tell you which fluid is appropriate for your aircraft. Be sure to follow the instructions. Generally, smaller aircraft are limited to Type I fluid. A Type III fluid has been developed for smaller aircraft; however, it is only available in limited regions. It is anticipated that this fluid will be more widely available in the next few years. The advantage of Type III fluid is that it contains some thickeners to increase HOT. Be sure your aircraft manufacturer recommends the use of Type III fluid before you use it.

Some pilots believe that any fluid can be used on an aircraft. This is not true. Do not use Type II or Type IV fluid on an aircraft that this fluid is not approved for. De-/anti-icing fluids are only required until the aircraft becomes airborne, after which the on-board de-/anti-icing systems operate. The rotation speed of an aircraft is important, as this determines which de-/anti-icing fluid should be used. Serious aerodynamic consequences can result from incorrect fluid use. The result could be disastrous, as the fluid will not shear off (blow off) on the take-off run, which may cause aerodynamic problems just after takeoff.

Remember, *Canadian Aviation Regulation* (CAR) 602.11(4) states (for non-airline operations):

Where conditions are such that frost, ice or snow may reasonably be expected to adhere to the aircraft, no person shall conduct or attempt to conduct a takeoff in an aircraft unless

(a) for aircraft that are not operated under Subpart 5 of Part VII,

  (i) the aircraft has been inspected immediately prior to takeoff to determine whether any frost, ice or snow is adhering to any of its critical surfaces, or

  (ii) the operator has established an aircraft inspection program in accordance with the *Operating and Flight Rules, Standards*, and the dispatch and takeoff of the aircraft are in accordance with that program.

If you use a holdover table for guidance, use the correct table for the fluid being used. There are some differences between fluids produced, and the holdover tables address specific fluids. Using the incorrect holdover table will lead to incorrect values for the integrity of the fluid and your HOT.

In certain cases, where cold snow is falling on a cold wing and definitely not accumulating or adhering to the critical surfaces, it may not be necessary to de-/anti-ice; however, be prudent and double-check the critical surfaces to ensure that no contamination is adhering or accumulating on them. This can only be done on the walk-around while conducting a tactile (touch) inspection of the surfaces. Be extra careful at night or during times where visibility is restricted, as visual detection can be impossible. Tactile inspection is the only positive method to ascertain the condition of the critical surfaces.

Various methods to remove contamination were discussed in the ASL 3/2005 article, so readers may want to read it again. When removing frozen contamination from the critical surfaces, also ensure that all elevator, aileron, and flap, etc., hinge lines are clean to avoid these surfaces refreezing after takeoff.

CAUTION
Anti-icing fluids (Types II and IV) have been known to remain in aerodynamically quiet areas such as elevator, aileron, and flap, etc., hinge lines after takeoff. They may re-freeze while airborne, causing control restrictions or flutter. Be aware of the manufacturer's recommendations to inspect and clean these areas after anti-icing to ensure no fluid remains trapped. To date, no re-freezing problems have been recorded with Type I fluids.

Active frost
Active frost normally occurs at night when aircraft surfaces are at or below freezing (0°C) AND at or below the dew point. Therefore, expect active frost conditions when the temperature-dew point spread is small, within about 2°C, and the dew point and aircraft temperatures are below freezing. Active frost will actively grow in mass and thickness, and will continue to form after being removed; whereas inactive frost, such as hoar frost, can be removed and normally will not form again.

The above conditions, combined with the VFR conditions of clear sky and calm winds, enhance the chance for active frost. If you choose to take off in these conditions, you will have to de-ice with Type I fluid, and anti-ice with Type II or Type IV. Owners of smaller aircraft types, unable to use Type II or IV fluid, can de-ice with heated Type I fluid, then reapply Type I fluid as an "anti-ice" a second time to create a fresh layer of protection and some additional HOT.

The National Aeronautics and Space Administration (NASA) Glenn Research Centre in Cleveland, Ohio, has two excellent products on aircraft ground and in-flight icing entitled, *A Pilot's Guide to Ground Icing and A Pilot's Guide to In-Flight Icing* **on their Web site located at:** http://aircrafticing.grc.nasa.gov/.

The most recent update, due in late 2006, includes a section on de-/anti-icing general aviation aircraft.

Flying a smaller aircraft type in the winter can provide a great opportunity to fly in smooth, clear weather conditions; however, these conditions can deteriorate quickly.

Use all the resources available to you—Internet, airport personnel or local weather—to determine ground-icing factors. Sometimes the best decision is "don't go"...your life may depend on it. △

When you push
the weather
and get into trouble,
remember who
put you there.

How Much is Too Much? Test Your Knowledge of Operations During Icing Conditions

by Captain Robert Kostecka, Civil Aviation Safety Inspector, Foreign Inspection, International Aviation, Civil Aviation, Transport Canada

In Canada, flying during the winter brings many challenges. Everyone who has driven a car on a slushy highway—or walked on an ice-covered sidewalk—knows that we need to be extra careful when weather conditions are poor. In addition to the problems of runway contamination, we also need to ensure that the aircraft's critical surfaces are not contaminated with frost, ice or snow.

For years, most pilots have understood that visible ice contamination on a wing can cause severe aerodynamic and control penalties. The continued occurrence of icing-related accidents makes it apparent that some pilots do not recognize that even minute amounts of ice adhering to a wing can have disastrous consequences. As far as frost, ice or snow adhering to the aircraft's critical surfaces is concerned, no amount is acceptable. Contamination makes no distinction between large aircraft, small aircraft or helicopters. The performance penalties and dangers are just as real. As winter approaches, it is a good idea to take a few moments to review flight operations during icing conditions. To help you prepare for this winter's challenges, here are a few questions that will illustrate some of what you need to know.

The questions have been divided into two groups. Part A consists of general knowledge questions that are applicable to all pilots. The questions in Part B are intended for the operators of larger and more complex aircraft that operate in ground icing conditions.

For your convenience, references and associated links have been provided. The answers to these questions can be found on page 38.

TP 10643 *When in Doubt...Small and Large Aircraft—Aircraft Critical Surface Contamination Training for Aircrew and Groundcrew*
www.tc.gc.ca/CivilAviation/general/Exams/guides/tp10643/how.htm

Canadian Aviation Regulations (CARs)
www.tc.gc.ca/civilaviation/RegServ/Affairs/cars/menu.htm

NTSB *Advisory*—Alert to Pilots: Wing Upper Surface Ice Accumulation
www.ntsb.gov/PressRel/2004/041229.htm

Part A: General Knowledge

1. Which of the following accidents was caused by ice on the aircraft's critical surfaces?

a) January 13, 1982: An Air Florida Boeing 737-200 crashed into the 14th St. Bridge and the Potomac River, and sank shortly after taking off from Washington National Airport. There were 74 fatalities.

b) March 10, 1989: An Air Ontario F28 crashed during takeoff from Dryden, Ont. There were 24 fatalities. (This crash resulted in a major investigation that led to the Air Regulations changes that are in place today.)

c) January 4, 2002: A Canadair Challenger crashed during takeoff from Birmingham, England. All 5 on board were killed.

d) All of the above.

Ref.: TP 10643 Chapter 1, "Air Law, The Clean Aircraft Concept"

2. For the purpose of aircraft icing, which of the following are considered to be the aircraft's "critical surfaces"?

a) The wings, rotors and propellers.

b) Control surfaces, horizontal stabilizers, vertical stabilizers or any other stabilizing surface of an aircraft.

c) In the case of an aircraft that has rear-mounted engines, the upper surface of the aircraft's fuselage.

d) All of the above.

Ref.: CAR 602.11—Aircraft Icing

3. It is a bright, crisp, clear winter day, and you are the pilot of a light training aircraft. You and your passengers are anxious to get underway. During the walk-around, you notice that there is a thin layer of frost on the upper surface of the wings.

Which of the following statements is correct?

a) A thin layer of frost may not be a problem. This is a matter of judgement and airmanship. Takeoff is possible in this situation. The Canadian Aviation Regulations (CARs) only prohibit takeoff when the amount of ice, snow or frost will adversely affect safety.

b) The CARs prohibit persons from conducting or attempting to conduct a takeoff in an aircraft that has frost, ice or snow adhering to any of its critical surfaces such as wings and propellers. This is called the "clean aircraft concept."

c) Research results have shown that fine particles of frost or ice the size of a grain of table salt and distributed as sparsely as one per square centimetre over an airplane wing's upper surface can destroy enough lift to prevent that airplane from taking off.

d) Both b) and c) are correct.

Ref.: CAR 602.11—Aircraft Icing
TP 10643 Chapter 1, "Air Law, The Clean Aircraft Concept"
NTSB Advisory— Alert to Pilots:
Wing Upper Surface Ice Accumulation

4. Which of the following statements concerning frost is correct?

a) Research results have shown that fine particles of frost or ice the size of a grain of table salt and distributed as sparsely as one per square centimetre over an airplane wing's upper surface can destroy enough lift to prevent that airplane from taking off.

b) CAR 602.11(3) states: "...a person may conduct a take-off in an aircraft that has frost adhering to the *underside* of its wings that is caused by cold-soaked fuel, if the *take-off is conducted in accordance with the aircraft manufacturer's instructions for take-off under those conditions.*"

c) Both a) and b) above are correct.

d) None of the above is correct.

Ref.: NTSB Advisory—Alert to Pilots:
Wing Upper Surface Ice Accumulation
TP 10643 Chapter 2, "Theory and Aircraft Performance—
Frozen Contaminants"
CAR 602.11(3)

5. You are travelling as a passenger on an airliner. Your flight has been delayed several hours because of a mechanical problem. The passengers are quite annoyed. Eventually, the airline has another aircraft towed to the gate.

As you take your seat, you notice that there is frost on the wings. The captain welcomes everyone aboard and says that because there is no traffic ahead on the taxiway, he expects to be airborne very quickly. He makes no mention of de-icing. You don't feel comfortable about the frost.

With respect to this situation, which of the following statements is correct?

a) In this situation, you should keep quiet and trust that everyone is doing their job. If the crew thought that de-icing was necessary they would do it. This is not your concern.

b) You should tell a flight attendant that there is frost on the wings. If a flight attendant observes that there is frost, ice or snow adhering to the wings of the aircraft, the CARs require that they must immediately report that observation to the pilot-in-command. The pilot-in-command or a flight crew member designated by the pilot-in-command must inspect the wings of the aircraft before takeoff.

c) Before an aircraft is de-iced or anti-iced, the pilot-in-command of the aircraft must ensure that the crew members and passengers are informed of the decision to do so.

d) Both b) and c) are correct.

Ref.: CAR 602.11(6)
CAR 602.11(7)
Aviation Safety Letter 1/2004

Part B: For Operators of Aircraft That Operate in Ground Icing Conditions

1. With respect to holdover times, which of the following statements is true?

a) Holdover time tables are referred to as holdover time "*guidelines*" because this term more appropriately represents their function in providing *guidance* to flight crew and the need for the flight crew to use judgment in their interpretation.

b) Holdover time guidelines provide an *estimate* of the length of time anti-icing fluids will be effective.

c) The actual time that a fluid is effective can be less than that published in the holdover time guidelines.

Factors including strong winds and jet blast may reduce holdover times.

d) All of the above statements are true.

Ref.: TP 10643 Chapter 2, "Theory and Aircraft Performance—Frozen Contaminants"

2. With respect to holdover times, which of the following statements is true?

a) Aircraft anti-icing fluid holdover times have not been evaluated under moderate and heavy freezing rain conditions.

b) The capability of anti-icing fluid to tolerate a heavy snowfall rate has not been evaluated; therefore holdover times for heavy snow conditions have not been generated.

c) Both a) and b) above are true.

d) None of the above is true.

Ref.: TP 10643 Chapter 2, "Theory and Aircraft Performance—Frozen Contaminants"

3. With respect to SAE Type I (de-ice) fluids, which of the following statements are correct?

a) SAE Type I (orange) fluids are used for de-icing or anti-icing, but provide very limited anti-icing protection.

b) It is the heat contained by the Type I (de-ice) fluid and the hydraulic forces that remove the frozen contaminants.

c) Extra vigilance is required by flight crews when conducting operations after spraying with Type I fluids only. Flash freeze over (fluid failure) can occur in a very short period of time after the holdover time expires, even in very light precipitation conditions. This results in a contaminated critical surface and an unsafe condition for flight.

d) All of the above.

Ref.: TP 10643 Chapter 3, "De-icing/Anti-icing Fluids—Fluid Properties"

4. With respect to SAE Type IV fluids, which of the following statements is correct?

a) Type IV anti-icing fluids should only be used on aircraft with rotation speeds (Vr) above 100 kt.

b) Type IV anti-icing fluid is dyed emerald green to provide for application of a more consistent layer of fluid to the aircraft and to reduce the likelihood that fluid will be mistaken for ice.

c) Both a) and b) are correct

d) None of the above.

Ref.: TP 10643 Chapter 3, "Deicing/Anti-icing Fluids—Fluid Properties"

5. An exemption to CARs 602.11(1) and (2) has been issued. The purpose of this exemption is to permit Canadian air operators and foreign air operators in Canada, utilizing aircraft with engines mounted on the rear of the fuselage, to conduct a takeoff with hoar-frost on the fuselage only, after it has been determined that no other contamination is adhering to the fuselage.

What are the conditions of this exemption?

a) Hoar-frost shall be the only acceptable contaminant on the fuselage of aircraft with engines mounted on the rear fuselage.

b) Prior to conducting a takeoff, the operator shall ensure that the hoar-frost is not mixed with other contaminants such as ice or snow. If any other contaminant or contaminants are on the fuselage, the operator shall de-ice the entire fuselage.

c) A copy of this exemption shall be attached to the aircraft de-icing/anti-icing procedures in the operator's manual.

d) All of the above.

Ref.: TP 10643 Chapter 1, "Air Law, The Clean Aircraft Concept"

2006–2007 Ground Icing Operations Update

In July 2006, the Winter 2006–2007 *Holdover Time (HOT) Guidelines* were published by Transport Canada. As per previous years, TP 14052, *Guidelines for Aircraft Ground Icing Operations,* should be used in conjunction with the *HOT Guidelines*. Both documents are available for download at the following Transport Canada Web site: www.tc.gc.ca/CivilAviation/Commerce/HoldoverTime/menu.htm. If you have any questions or comments regarding the above, please contact Doug Ingold at INGOLDD@tc.gc.ca. △

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The Aircraft Certification Branch, Engineering Division

by the Engineering Division, Aircraft Certification, Civil Aviation, Transport Canada

Who we are

The Aircraft Certification Branch is one of the largest in Civil Aviation in the National Capital Region, with a staff of about 150 in eight divisions. With approximately 40 engineers, the Engineering Division is the largest within the Branch and is grouped in six specialty areas, representing a diverse set of technical skills, expertise and abilities—Avionics & Electrical, Fuel & Hydro-Mechanical Systems, Structures, Powerplants & Emissions, Electronic Equipment Design Assurance (Software) and Occupant Safety & Environmental Control Systems.

These specialties are required to support the Aircraft Certification Branch in approving the type design of aeronautical products, otherwise known as "Type Certification." The products approved range from large transport aircraft and rotorcraft to small two-seater aircraft and the engines that power them.

What we do and why

"Safe skies start with safe aircraft, and safe aircraft start with safe designs." This phrase captures the essence of the Branch's and the Division's *raison d'être*.

Although many of the engineers in this Division have engineering degrees and extensive industry experience in the design of aircraft, aircraft systems, engines and components, our role is not to design aircraft. We are in the "design assurance" business and we work with our Canadian aerospace industry to understand their product designs, and validate that these designs meet the internationally-accepted design standards. When this is confirmed, the Director, Aircraft Certification Branch, will issue a "Type Certificate," which signifies that the design meets comprehensive safety and emissions standards.

This type certification function is one of many related activities. We are also involved in the review and acceptance of foreign-designed aircraft and engines; participate in the development of the design standards in harmonization working groups with other foreign authorities, such as the U.S. Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA); are involved with the Continuing Airworthiness Division in reviewing the impact of design deficiencies in certified aeronautical products and determining the appropriate corrective action; provide technical support to regional aircraft certification engineers, inspectors and industry involved in the modification and repair of aircraft in the Canadian fleet; and assess and participate in the certification and oversight of industry design approval delegates.

How we do our job

We typically work in project teams, internally within Transport Canada Civil Aviation (TCCA), and externally with industry. For a new aircraft program, there will be at least one engineer from each engineering section, with a flight test pilot and engineer, and a project manager who leads the team. This team works closely with the industry engineering specialists, and delegates who are responsible for designing and demonstrating that the new aircraft design meets the regulatory requirements.

The certification program for a new transport-category aircraft can take up to five years, and for an engine the program can take up to three years. Derivatives, or changes, to these initial designs take less time, but can use as many resources. As a result, at any one time, an engineer within the Engineering Division could be a team member on as many as ten or more certification programs running in parallel, in addition to participating in the other activities noted above. So, the ability to multi-task is essential.

Much of the time, our business is conducted at the industry facilities, or industry engineers meet with us in Ottawa, Ont. Typically, day-to-day communications with the company specialists are done via phone, videoconference, e-mail and increasingly, via web-based data-sharing "portals" that allow the exchange of large documents. Today, a lead company using "design partners" in other countries creates most large aircraft. As a result, it is not unusual to have Engineering Division specialists travelling to witness a "cold soak" test of an aircraft in Iqaluit, Nun., or a flight control system test in Germany, or an electronic engine control test in the USA.

At the beginning of an approval program, the TCCA engineering specialists will spend considerable time with the industry delegates to understand the proposed design and how the company proposes to show that the design

meets the applicable safety and emission standards. The aircraft and system design, and the standards that must be met, are very complex and the compliance demonstration process is similarly complex. Depending on the design feature, compliance with the design requirements may be demonstrated by test, engineering analysis or inspection. Both the tests and analyses can be very complex and expensive, the interpretation of results can be difficult, and pass/fail criteria are often subjective. This is where "engineering judgment" comes in.

During the approval program, there is so much compliance data generated, it would be impossible for TCCA engineers to review it all, so there is significant reliance on the capability and expertise of the industry designing the product and the delegates. The TCCA engineer must use a risk-based approach to determine where and when to be involved in reviewing the compliance data—focussing, for example, on critical safety areas, unusual designs or technology, or compliance methods.

At the end of the approval program, based on the company and delegate activities and the TCCA engineers' involvement, the company will have demonstrated that the design complies with the requirements and that there are no unsafe features. At this point, the Type Certificate can be issued.

In summary

As an essential link in the establishment of a safe aircraft, an engineer in the Engineering Division of the Aircraft Certification Branch has a challenging job that offers a unique opportunity to work with both Canadian and foreign aerospace companies that design and manufacture aircraft, rotorcraft, engines and associated systems. △

Inadequate Identification of Fuel Barrels

An Aviation Safety Information Letter from the Transportation Safety Board of Canada (TSB)

On July 16, 2005, a Bell 205 A-1 helicopter was engaged in forest fire suppression and longline slinging operations in the province of Quebec. While hovering with an empty water bucket on a 100-ft longline, with the bucket 15 ft above the water, the pilot felt a vibration, heard a bang, and the engine lost power. The aircraft quickly lost altitude, pitched nose down and to the right, then struck the water. The two pilots were able to exit the aircraft before it sank and were rescued by nearby firefighters. The pilot-in-command was seriously injured, and the other pilot sustained minor injuries. The aircraft was substantially damaged. The investigation into this accident (A05Q0119) is ongoing.

The *Société de protection des forêts contre le feu* (SOPFEU) is responsible for the prevention, detection, and suppression of forest fires in Quebec. During forest fire suppression operations, SOPFEU will contract helicopters and other aircraft to fulfill their operational needs. Barrels (205 L) of fuel are ordered from local wholesalers and delivered to the nearest fire suppression operations staging area.

Photo 1: View of fuel barrels at base camp

The on-going investigation into this occurrence revealed that the wholesaler had mistakenly delivered four barrels of Avgas and 36 barrels of Jet A fuel, instead of 40 barrels of Jet A fuel. It also revealed that workers loading the product on the truck at the wholesaler's yard and those delivering the product to SOPFEU had mistakenly identified the product. The pilots using the product did not correctly identify it before fuelling. Two of the four helicopter operators working from the staging area mistakenly fuelled their aircraft with Avgas.

(Note: The Aeronautical Information Manual (AIM) section AIR 1.3.2 Aviation Fuel Handling states in part: "...A company supplying aviation fuel for use in civil aircraft is responsible for the quality and specifications of its products up to the point of actual delivery. Following delivery, the operator is responsible for the correct storage, handling, and usage of aviation fuel..."

Although a number of turbine engines may burn Avgas as emergency fuel for a limited time without a negative outcome, it is not the case if the same mistake is made while fuelling a piston engine aircraft with Jet fuel. The B205 operations manual only authorizes the use of Jet A or Jet B. The use of Avgas in this accident is not deemed to have been contributory to the loss of engine power.

The barrels delivered were all white, and all identifying stickers were also white. The identifying stickers included all the necessary information, as specified by provincial

regulations. The only difference between the two products was the words "100LL Avgas" and "Jet A fuel." (See photos 1 and 2 taken on site.)

Photo 2: View of fuel barrel labels

The wholesaler need only ensure that the petrol product they deliver meets provincial regulations, i.e. the container must be cleaned, filled, and sealed on site; and identifying stickers affixed on the container must include the date, the type of product, batch number, and dangerous goods information.

Contrary to federal regulations applicable for fuel distribution at airports and aerodromes, provincial laws do not require the container or the identifying stickers to differ in colour, even though the product is different. Therefore, the different petrol products can easily be mistaken and lead to fuelling an aircraft with the wrong type of fuel. Avgas is considered a Class 1 petrol product, and under existing provincial regulations, a Class 1 product over 45 L does not require any kind of colour coding of the container. However, a container under 45 L, containing a Class 1 product, must be predominately red in colour.

Therefore, by provincial law, the 205-L barrels of Avgas do not have to differ in colour from a Class 2 (Jet fuel) or Class 3 product. Colour differentiation of the identifying stickers is also not required. The different products, concealed in the containers, and not visible to the user, have a different colour and smell; Avgas is blue and Jet fuel is yellow.

According to the *Aeronautics Act*, the base camp and fuel cache from which the helicopters were operating are considered an aerodrome. Distributors of a petrol product at an aerodrome are subject to federal regulations and must ensure that the type of product is specifically identifiable by a given colour of container, pump, and/or label.

The use of fuel barrels for remote aircraft operations is widespread throughout Canada. It is of the utmost importance to ensure that the product not only be identifiable by name, but that it also be distinguishable from another petrol product in a more predominant manner. The quality control of the petrol product provided to an aircraft operator at an airport should also be assured when operating at an aerodrome. △

Aircraft Maintenance Operational and Functional Checks

by Norbert Belliveau, Civil Aviation Safety Inspector, System Safety, Atlantic Region, Transport Canada

Aviation maintenance is a very complex industry. We aircraft maintenance engineers (AME) maintain every type, model and size of heavier-than-air aircraft that are flown in the world today.

On many occasions, our profession requires that we perform certain tasks that may demand more alertness and care than others. One such task relates to the aircraft "static functional checks," or as we would refer to them, *"ground runs."* Through training and experience, functional checks or taxiing of an aircraft are performed safely and without incident; however, when we are under pressure, trying to meet schedule demands, fatigued, or being affected by any other such contributing factor, a step can easily be overlooked and the operation can end with a much different outcome.

Aircraft functional checks, such as power performances, system deficiencies, compass swings, and engine washes, are only carried out on an irregular basis. The potentially long interval between *"ground runs"* may have created a certain "system layout" or "operational" uncertainty for the AME in the cockpit. I believe pilots call this "currency"! The operation of an aircraft holds a lot of responsibility. Even if an individual has previously performed this task many times, it only takes one very important step to be forgotten or overlooked for a serious occurrence to happen. The dynamic environment we operate in leaves little room for error.

The following steps are a reminder for the AMEs prior to performing aircraft operational or functional checks. Note that this does not, and is not meant to, replace the aircraft's pilot operating handbook (POH) operation checklist.

Before the task:

1. Confirm inspection sheets/package are completed and appropriately signed off.
2. Check records/worksheets for any special attention required during aircraft operation.
3. Confirm personnel are trained, current and appropriately endorsed on type.
4. Be familiar with airport operator's policies, procedures/practices, aprons, signage, runways, and designated ground run areas.
5. Take along a copy of the aerodrome diagram for reference [*from Canada Airport Charts* on the NAV CANADA Web site, or from the *Canada Air Pilot* (CAP)].

Before start:

1. Always refer to the aircraft's POH operation checklist. Never rely on memory.
2. Conduct a walk around of the aircraft and area for foreign object damage (FOD), loose items, control locks, inlet plugs, covers, chocks, tow-bars and tie downs.
3. Check for personnel or parked aircraft nearby. Reposition the aircraft to prevent damage or injuries.
4. Verify that the nose gear torque links attachment is secure.
5. Verify all the aircraft fluid levels. Take fuel samples, as appropriate.
6. Ensure all panels and engine cowlings are in place and secured, as required for engine operation.
7. Check that all breakers and fuses are set.
8. Place a fire extinguisher nearby, and have trained personnel on visual watch, as required.
9. Be familiar with the location of on-board fire extinguishers.
10. Verify brake operation.
11. Be familiar with the aircraft communication equipment, frequencies, and radio licence requirements.
12. Always carry a reliable flashlight when doing functional checks at night.
13. Be familiar with the aircraft emergency procedure checklist.

During operation and taxiing:

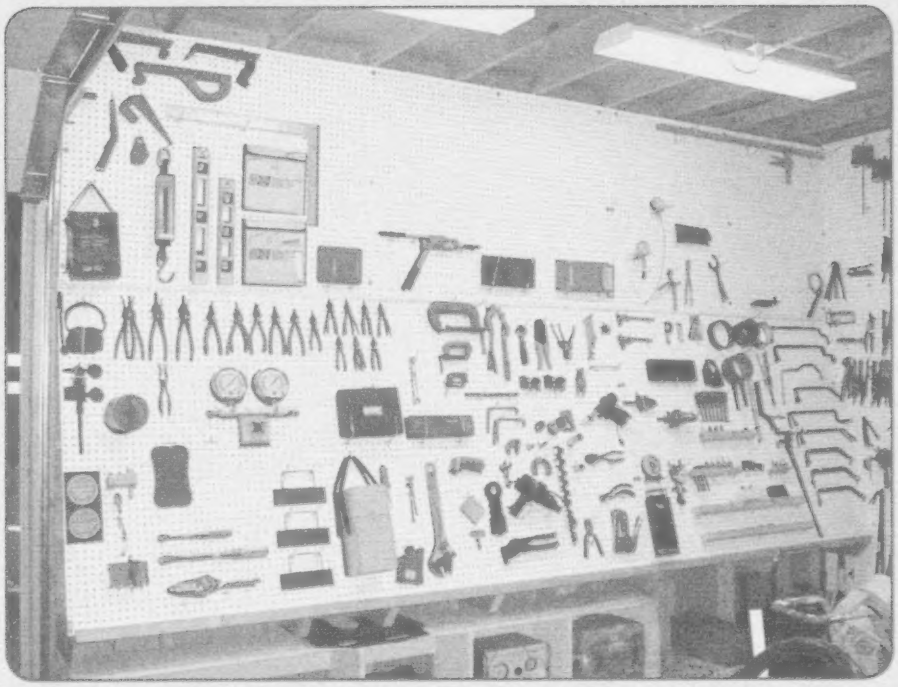
1. Always maintain communication with ground or apron controller, and report intentions before moving.
2. Position aircraft into the wind for optimized engine cooling.
3. Consistently monitor engine parameters from left to right and top to bottom for irregularities.
4. Always remain within the aircraft operating limitations.
5. Maintain professionalism in the cockpit.
6. Do not RUSH!
7. Keep taxi speeds to a minimum.
8. While taxiing, keep hands and feet on controls at all times.
9. Be prepared to shut down the engines.

Secure the aircraft:

1. Again, refer to the aircraft's POH operation checklist. Never rely on memory.
2. Follow the recommended engine cool down period.
3. Ensure all switches are turned off, and breakers are checked.
4. Visually check fluid levels and surrounding areas for fluid leaks.
5. Properly secure the aircraft.

As professionals, we must always try to lead by example. So remember, the next time you are heading out to perform an operational check or taxiing, once the main aircraft cabin door is closed and you are sitting at the controls, it is now you, the environment and that precious aircraft! △

Tool Control Reminder



A meticulously maintained tool control board enhances safety

The picture above shows an example of a well-executed tool management system, or tool control board, in an aircraft maintenance engineer's (AME) shop on the east coast. The Regional Aviation Safety Officer—Maintenance in Moncton, N.B., Mr. Norbert Belliveau, reports that, " since we introduced the *Aviation Maintenance Tool Management* CD-ROM, many more AMEs and pilot-owners have undertaken to improve their tool control significantly."

The purpose of a truly disciplined and regimented tool management system in aviation is to ensure all tools, without exception, are accounted for before and after every job, and that one tool does not go missing, with the possibility that it was left in the aircraft, in the same way a surgeon would leave a clamp in the body of a patient (it DID happen...). It takes a strong work ethic and applied discipline to achieve a perfect tool management system, and thankfully, licensed aviation personnel have already demonstrated those traits.

Your tool management system should allow you to immediately notice if a tool is missing after all tools are put back in place, either through a numbering system, tool shadows on the board, colour-coding, or combinations of all three. A complete aviation tool inventory check must be done before and after every job. Keep your aviation tools separate from your home tools—we all know the hammer and the vise-grip can go missing at home, but aviation wrenches and wire-cutters must always be accounted for.

The *Aviation Maintenance Tool Management* CD-ROM (TP 14123) is an educational package aimed at the aerospace industry, and can be used in the teaching of methods to control foreign object damage (FOD) in the various working environments that aircraft engineers and technicians work in. This CD contains a PowerPoint presentation and the video, *Foreign Object Damage* (TP 14087). Order it today from Transact, the online storefront for Transport Canada publications at www.tc.gc.ca/transact/, or by calling Transport Canada's Order Desk at 1-888-830-4911. △

Civil Aviation Safety Inspector's (CASI) Toolkit CD

Ever wonder what work tools Civil Aviation Safety Inspectors use in the field? One such tool is the CASI Toolkit CD.

The CD contains regulations, guidelines, standards, and forms in a powerful, searchable database. In most cases, the documents are also in PDF format. Transport Canada has also recently decided to terminate the issuance of the *Canadian Aviation Regulations* (CARs) CD and allow all industry users to order the same CD that is issued to Civil Aviation Safety Inspectors every six months.

The *CASI Toolkit* CD (TP 12916) is available for purchase from Transport Canada's online publications storefront at www.tc.gc.ca/transact, or by calling Transport Canada's Order Desk at 1 888 830-4911. You can order either a single copy ($35.00, which includes shipping, but excludes applicable taxes), or take out a subscription for future copies to be automatically shipped to you. △

Mandatory Reporting of Unfit Pilots, Air Traffic Controllers and Flight Engineers

Did you know that, by law, all physicians in Canada must inform a Regional Aviation Medical Officer (RAMO) of any pilot, air traffic controller or flight engineer who has a medical condition that could adversely affect flight safety? (Note—for purpose of this article the term "medical certificate (MC) holder" will be used to apply equally to pilots, air traffic controllers and flight engineers, unless otherwise stated.)

Subsection 6.5(2) of the Aeronautics Act requires that: The holder of a Canadian aviation document that imposes standards of medical or optometric fitness shall, prior to any medical or optometric examination of his or her person by a physician or optometrist, advise the physician or optometrist that he is the holder of such a document.

Therefore, as a MC holder you must inform any physician—not just your Civil Aviation Medical Examiner (CAME)—of your status before each examination or treatment. Your physician must consider whether your condition or treatment would constitute a hazard to aviation safety, and if this is likely, inform a medical adviser designated by the Minister (the RAMO) of that opinion and the reasons behind it.

If uncertain whether a hazard exists, your physician can discuss your case with the RAMO hypothetically—without revealing your identity—until it appears necessary that a flying restriction may be necessary. This does not necessarily mean that your medical certificate will be suspended; however, the RAMO will make inquiries to confirm whether you remain medically fit. If the condition or treatment is self-limited, you would be advised not to fly until after recovery.

You should also remember that under *Canadian Aviation Regulation* (CAR) 404.06, *Prohibition Regarding Exercise of Privileges*, MC holders who know, or are informed, that they have a condition (or are prescribed treatment) that might make it unsafe to perform their duties, must "ground" themselves temporarily.

In some cases, a physician may choose to report a suspected unfit MC holder confidentially—without informing the individual. This is more likely to occur where no on-going relationship exists between the physician and MC holder, for example during or after an emergency room visit.

Once a report under section 6.5 of the *Aeronautics Act* has been made, it is the RAMO's responsibility to take further action. Although Transport Canada may use the reported information as necessary to ensure aviation safety, the report itself is privileged and cannot be used as evidence in any legal, disciplinary or other proceedings. When you sign the "Statement of Applicant" on a Medical Examination Report, this is considered as your consent for giving information to a medical adviser designated by the Minister when required under the Act.

If your name and condition were reported confidentially, you would likely receive a registered letter from the RAMO requesting further clinical reports to assess your condition. You would also be reminded of your obligation not to fly (CAR 404.06) pending a decision in your case.

Canadian physicians are currently being reminded of their responsibilities for reporting, and given some guidance on the types of medical problems that might warrant restrictions. Here are some of the symptoms and conditions to be considered, listed by system (abridged list):

Vision

Conditions where visual impairment is temporary or vision is temporarily affected by the use of medications need not be reported. The MC holder should be warned not to fly until normal vision has returned.

Reportable:

Diplopia (double vision); monocularity; altered visual fields; eye injuries or retinal detachment; cataract surgery; surgical correction of myopia, including radial keratotomy (RK), photorefractive keratectomy (PRK), laser-assisted in-situ keratomileusis (LASIK) or other refractive eye surgery.

Ear, nose and throat

Significant deterioration in hearing must be reported. Any condition affecting balance or spatial orientation must be reported.

Reportable:

Sudden loss of hearing, or conditions significantly affecting hearing; middle-ear conditions; damage to the tympanic membranes (ear drum) or the Eustachian tubes; any condition affecting or impinging upon the inner ear or the vestibular (balance) organs; stapedectomy and other ear surgery; surgery affecting the nasal passages, sinuses or Eustachian tubes; conditions leading to voice distortion or inaudibility.

Cardiovascular

The appearance of cardiovascular signs or symptoms is of great concern and must be discussed with the RAMO. Even benign cardiac rhythm disturbance can cause distraction that, during critical phases of flight, may cause an incident or accident. Medications to treat blood pressure with side effects of fainting/postural hypotension, arrhythmias or effects on the central nervous system are unacceptable.

Reportable:

Cardiac inflammation and infection; acute ischemic syndromes (heart attack, angina); revascularization surgery (bypass or angioplasty, including stent insertion); initial treatment of hypertension with medication; symptoms of low blood pressure; new heart murmurs; significant heart disease; repair or replacement of heart valves; premature contractions; tachyarrhythmias (fast heart rhythms); bradycardia (slow rates) with symptoms; fibrillation; heart block and bundle branch blocks; pacemakers.

Cerebrovascular

MC holders who show any evidence of memory loss, poor concentration or diminished alertness must be reported.

Reportable:

Transient ischemic attack (TIA) or cerebral artery stenosis that has led to confusion, disturbance of vision, attacks of vertigo or loss of consciousness; stroke or any other cerebrovascular accident.

Other vascular disorders

Reportable:

Aortic aneurysms; surgical repair of an aneurysm; deep venous thrombosis.

Nervous system

Disorders of the central nervous system can be a potent source of occult incapacitation. Lapses of consciousness or memory in the aviation environment can be fatal.

Reportable:

Syncope (fainting); unexplained loss of consciousness, whatever the cause; seizure disorders; any significant head injury, unconsciousness or post-traumatic amnesia; sleep disorders of any type; migraine with aura; severe or prolonged headaches; disorders of coordination and muscular control.

Respiratory

Gradual deterioration of the respiratory system over the years may not be obvious, particularly if the pilot does not complain, or is using bronchodilator medications. Physicians treating MC holders must remain alert to the risk of hypoxia and trapped gas expansion (e.g. pneumothorax) when deciding upon treatment.

Reportable:

Spontaneous pneumothorax, lung cysts or other conditions that may lead to problems with expansion (this may be of less significance in air traffic controllers); chronic obstructive pulmonary disease; significant decreases in pulmonary function or oxygen saturation; asthma—increasing requirements for inhaled bronchodilators or steroids; pulmonary embolism; sarcoidosis.

Metabolic

Reportable:

Diabetes mellitus—type 1 diabetes (insulin-dependent) when first diagnosed (pilots and air traffic controllers requiring insulin are considered on an individual basis); type 2 diabetes (non-insulin-dependent) on first requirement for hypoglycemic drugs, changes in type or dose of medication or hypoglycemic attacks requiring treatment; initial diagnosis or significant changes in treatment of thyroid and parathyroid disease; pituitary or adrenal disease.

Renal system

Reportable:

Renal colic (kidney or bladder stones); renal failure; renal transplantation.

Musculoskeletal system

Reportable:

Recent amputation of a limb or part of a limb; arthritis treated with second- or third-stage medications (e.g. Gold, azathioprine).

Psychiatric disorders

The level of tolerance for mental disorders or disease is small. Even when symptoms are effectively treated, the side effects of psychoactive drugs, such as selective serotonin reuptake inhibitors (SSRI) are usually unacceptable.

Reportable:

Cognitive disorders; dementia; psychosis; bipolar affective disorder (manic-depressive); emotional disorders that require drug therapy or may interfere with judgment, decision making or reaction time.

Tumours

Reportable:

Any tumour that limits the ability of a MC holder to perform safely; tumours that may metastasize to the brain.

HIV/AIDS

Reportable:

Positive test for HIV; diagnosis of AIDS.

Drugs
Reportable:

MC holders who abuse or are addicted to alcohol or other chemical substances.

Note:
Physicians should discuss in detail the side effects of any medication that is prescribed or recommended to pilots. Minor side effects, for example, on visual accommodation, muscular coordination, the gastrointestinal tract, or tolerance to acceleration, may be more serious when they occur in flight. If in doubt, the physician should discuss the medication with the RAMO.

Generally, MC holders are advised to avoid taking any medication within 12 hr (or, if longer-acting, within about five half-lives) before a flight if pharmacological effects may affect flying. Although there are exceptions to this rule, caution is advised.

There is no general rule about how long a MC holder should be grounded after receiving a general anesthetic. It depends on the type of surgery, premedication, and the anesthetic agent. Physicians should be aware that the effect of some anesthetics may take days to wear off, and caution is recommended.

Adverse reactions to local anesthetic are uncommon after the effect of the anesthetic has worn off, but in cases where they have been used for extensive procedures, such as the removal of several teeth, flying should be restricted for a minimum of 24 hr. One must be aware that dental surgeons sometimes prescribe long-acting tranquillizing agents before surgery, as well as narcotic pain-killers for post-operative discomfort.

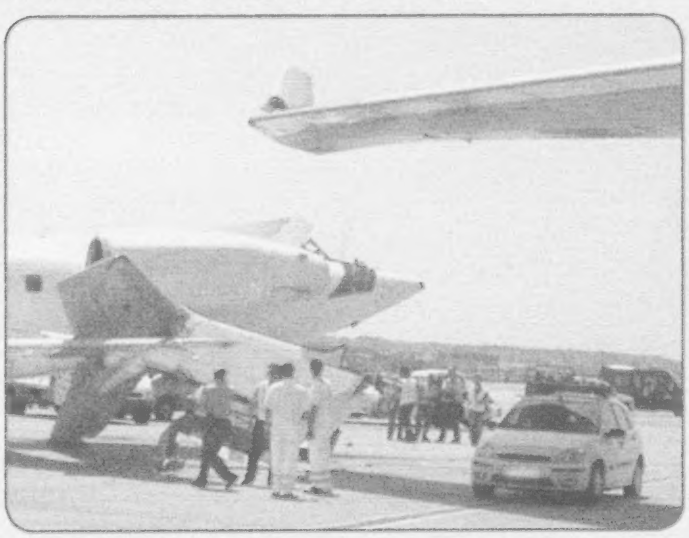
Contact Information

If you have any questions regarding your personal medical fitness, they should be directed to either your CAME or RAMO. Toll-free numbers for the regional medical offices are printed on the tear-off bottom section of your medical certificate, as well as published on our Web site (under Contacts) at www.tc.gc.ca/CivilAviation/Cam/offices.htm.

The following references are available online:
The Aeronautics Act www.tc.gc.ca/acts-regulations/GENERAL/a/aa/act/menu.html.

Canadian Aviation Regulation (CAR) 404.06, Prohibition Regarding Exercise of Privileges
www.tc.gc.ca/CivilAviation/Regserv/Affairs/cars/Part4/404.htm#404_06. △

Ground Collisions Give Us Warning



The photo on the left shows the result of a spectacular ground collision on July 15, 2006 in Madrid, Spain. The wingtip of a taxiing Boeing 747-400 sliced clean the T-tail of a stationary Embrear 145 jet. Fortunately there were no injuries, but there was significant stress for all involved.

A more tragic ground collision occurred on July 30, 2006, at *AirVenture 2006* in Oshkosh, Wisconsin. A small Van's RV-6 homebuilt aircraft was struck from behind on a taxiway by a larger aircraft, a World War II era Navy Grumman TBM Avenger. The Avenger's propeller tore through the tail of the RV and fatally injured the passenger. Both occurrences are still under investigation, but they serve as grim reminders to all pilots to keep an alert eye outside and to mind our distances. △

Answers to "How Much is Too Much?" Quiz

Part A: (1) d, (2) d, (3) d, (4) c, (5) d. Part B: (1) d, (2) c, (3) d, (4) c, (5) d.

There is no such thing as a little ice. In airline operations where large numbers of aircraft are dispatched, the process of assuring that each flight will be safe must be a team effort. In smaller commercial and in private operations, the pilot may have to perform all the functions. In all cases, the pilot-in-command is ultimately responsible for ensuring that the aircraft is in a condition for safe flight. If the pilot cannot confirm that the aircraft's critical surfaces are free of contamination, takeoff must not be attempted.

Answers to the Self-Paced Study Program (tear-off)

(1) 30.27

(2) incidents; potentially unsafe acts or conditions

(3) increase

(4) "X"

(5) 15

(6) will

(7) unreliable; it transmits

(8) 15

(9) It conveys the ability to follow direct routings using GPS.

(10) No

(11) 123.45

(12) landing and takeoff; forecast weather elements

(13) hatched areas enclosed by a dashed green line

(14) 1 500; WS

(15) one hour

(16) 270 degrees at 15 kt gusting to 25 kt

(17) 3/8 SM; light snow and drifting snow

(18) True; True; True; True

(19) No

(20) CIRVIS report

(21) shall

(22) five

(23) flight plan

(24) one hour

(25) 1-888-226-7277; two hours

(26) 121.5

(27) Inspect the ELT to ensure that it is secure, free of external corrosion, and that the antenna connections are secure; ensure that the ELT function switch is in the "ARM" position; ensure that ELT batteries have not reached their expiry date; and listen on 121.5 MHz to ensure the ELT is not transmitting.

(28) Position, altitude and time when signal was first heard; ELT signal strength; position, altitude and time when contact lost; and whether ELT signal ceased suddenly or faded.

(29) Place the ELT function switch to "ON" as soon as possible after the crash.

(30) 1530; December 15, 2006

(31) A replacing or canceling NOTAM is required.

(32) It is a replacing NOTAM.

(33) 60; 24

(34) personal log

(35) 5-year and 2-year; 6-month

(36) 5; 6

(37) ordinary combustible materials

(38) 50

(39) 10 000

(40) climb back to the original altitude or to a higher level

Definitions of Interest...

"Reportable Service Difficulty" means any defect, malfunction or failure of an aeronautical product, component, equipment or part affecting, or that, if not corrected, is likely to affect, the safety of the aircraft, its occupants or any other person.

"Unapproved Part" means any part installed or intended for installation in a type certified aeronautical product, that was not manufactured or certified in accordance with the applicable regulations of the state of production or that is improperly marked or that is documented in such a manner as to mislead with regard to the origin, identity or condition of the part.

(Ref.: CAR Standard 591.01 – Service Difficulty Reporting Requirements)

Safety Management Systems—Raising the Bar on Aviation Safety

by Jean-François Mathieu, LL.B., Chief, Aviation Enforcement, Civil Aviation, Transport Canada

A safety management system (SMS) is a structure of systems designed to identify and eliminate risks and improve the safety performance of air operators. SMS is intended to increase industry accountability, and to nurture and sustain a safety culture, whereby employees can confidentially report safety deficiencies without fear of subsequent punitive action. Regulation will eventually require all Transport Canada operating certificate holders to implement an SMS.

The following event illustrates the value of an SMS in advancing aviation safety when there has been a contravention of the regulations.

On a clear January morning, an Airbus 310 departed Halifax, N.S., for Calgary, Alta., and climbed to a cruising altitude of 34 000 ft. After completing the routine cruise checks, the crew settled back and the 256 passengers relaxed and enjoyed a light breakfast. As they were approaching Montreal, Que., the captain checked the en-route weather while the first officer took fuel quantity readings and compared them with the flight plan figures required to complete the flight to destination. The first officer suddenly realized that they had not taken on enough fuel prior to their departure from Halifax. After confirming the readings and manually recalculating the minimum required fuel to complete the flight to Calgary, he informed the captain. They both double-checked the fuel remaining against the fuel required. The insufficient fuel state was confirmed and they agreed to plan an unscheduled refuelling stop in Toronto, Ont. Montreal Centre and company dispatch were both advised of the fuel condition and they respectively authorized and concurred with the revised routing.

From a regulatory standpoint, the pilot-in-command and the operator, contravened *Canadian Aviation Regulation* (CAR) 602.88(2) for not carrying sufficient fuel for the planned route. The enforcement process initiated following this contravention is typical of what would happen within any aviation company that operates in accordance with an SMS.

The Aviation Enforcement Division became aware of the event through an occurrence report in the Civil Aviation Daily Occurrence Reporting System (CADORS), and notified the Transport Canada principal inspector responsible for the operator. The principal inspector confirmed that the crew had, as required under SMS, internally reported the incident to the operator.

In line with SMS philosophy, the operator developed and submitted a corrective action plan (CAP) to the principal inspector, outlining a systematic approach to address the fuel mismanagement and to prevent a recurrence. The CAP included revised pre-flight and in-flight standard operating procedures (SOP) designed to ensure accurate flight-planned fuel calculations and accurate fuel-on-board monitoring prior to, and during, flight. These procedures for proper fuel management were incorporated into a mandatory training seminar for all flight crew members. The principal inspector reviewed the CAP and was confident that it addressed the issues that led to the initial contravention. In consultation with the principal inspector, the Aviation Enforcement Division could have reactivated the investigation at any time during the process leading up to the acceptance of the CAP, and would have, if:

the contravention had been intentional;
the incident had not been internally reported; or
the principal inspector had found the CAP to be unacceptable, and the operator had refused to address the issue.

Had the decision been to continue the investigation, a letter of investigation would have been sent directly to the operator, and the principal inspector would have been notified. In this specific case, the investigation was closed without further enforcement action.

Although the story in this article does not depict an actual event, it does serve to illustrate a typical SMS response, designed to raise the bar on aviation safety following a regulatory contravention.

For further clarification, we invite you to consult the Aviation Enforcement Policy and Procedures—Safety Management Systems Web site at www.tc.gc.ca/civilaviation/SMS/policy.htm. △

Post-Accident Survivability—Direct-to-Airframe Helmet Cord Connections

An Aviation Safety Advisory from the Transportation Safety Board of Canada (TSB)

On December 7, 2005, an MBB-BO105 helicopter was operating near Marystown, N.L. The helicopter was observed flying along the shoreline, at low altitude, in snow, and in darkening conditions. The helicopter struck the water about 1 000 ft from shore, and sank to the bottom of Mortier Bay. The pilot and passenger escaped from the helicopter; however, they later perished in the frigid water. The TSB investigation into this accident (A05A0155) is ongoing. After the accident, an examination of the pilot's aviation helmet found that the end fitting of the communication cord was fractured at the point where it attaches to the helicopter (see Figure 1).

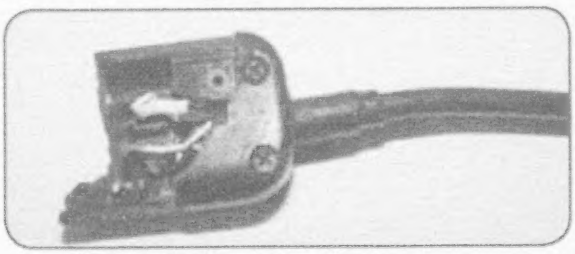


Figure 1. Fractured cord end fitting

The communication cords for front-seat occupants connect to receptacles located on the overhead center console. When the helicopter was recovered, the metal pins from the end fitting were still inside the receptacle. Metal remnants from the connection show that the cord was being pulled sideways, towards the pilot's door, when the fracture occurred. A downward pull is required to release the connection. A break test of a similar fitting required a 70-lb pull before the cord failed. After ditching or water impact, the occupants of a capsized helicopter are prone to disorientation. Therefore, unimpeded egress through any available exit is vital to survival. An attached communication cord that will not release cleanly may impede this egress.

In the past, similar BO-105 helicopters have been fitted with an intermediate "pig-tail" communication cord for helmet connections. Instead of plugging the helmet cord into the helicopter's receptacle, the helmet cord is instead plugged into this intermediate cord (see Figure 2).

The helmet connection plug can release cleanly from the intermediate "pig-tail" cord receptacle as it is pulled in the direction of travel during egress. Over a period of years, the use of the intermediate helmet cords at this operator declined, perhaps because pilots were not aware that the cords ensure separation in an emergency. However, since this accident, the operator has indicated that the use of intermediate "pig-tail" cords for helmet connections will now be re-instituted where necessary.

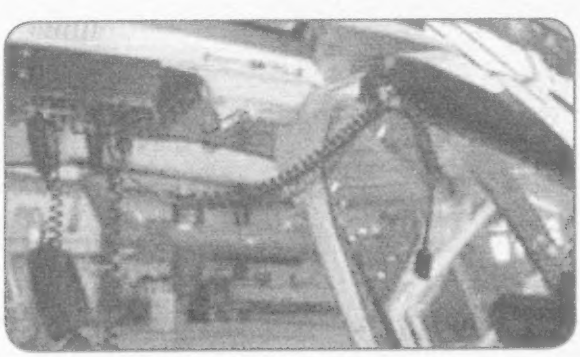


Figure 2. Intermediate helmet "pig tail" connection cords

Other operators may have aircraft with similar direct-to-airframe connections, and may be unaware that these can impede egress in an emergency. Therefore, Transport Canada may wish to advise the aviation community that these connection types may impede egress, and that an intermediate cord can help to mitigate this hazard.
Done. —Ed. △

Flight Crew Recency Requirements
Self-Paced Study Program

Refer to paragraph 421.05(2)(d) of the Canadian Aviation Regulations *(CARs).*

This questionnaire is for use from November 1, 2006, to October 31, 2007. Completion of this questionnaire satisfies the 24-month recurrent training program requirements of CAR 401.05(2)(a). It is to be retained by the pilot.

Note: The answers may be found in the Transport Canada Aeronautical Information Manual *(TC AIM). TC AIM references are at the end of each question. Amendments to this publication may result in changes to answers and/or references.*

1. Convert 1020.5 millibars into inches of mercury. _____ (GEN 1.9.2)
2. The SECURITAS program provides a means for individuals to report _____ and _____ relating to the Canadian transportation system. (GEN 3.6)
3. Runway contaminants such as water, snow or ice will (increase/decrease) the landing distance. (AGA 1.1.5)
4. When a section of runway or heliport is closed, it is marked with an ___. (AGA 3.3 and AGA 5.6)
5. Control of ARCAL lights should be possible when aircraft are within ___ NM of the aerodrome. (AGA 7.19)
6. Retroreflective markers (will/will not) provide the pilot with the same visual presentation as normal runway lighting when the aircraft is lined up on final approach. (AGA 7.20)
7. The removal of the audio identification from non-directional beacons (NDB), VHF omnidirectional ranges (VOR), distance measuring equipment (DME) or instrument landing systems (ILS) warns pilots that the facility may be _____ even though _____. (COM 3.2)
8. A wide area augmentation system (WAAS) NOTAM will be issued when a WAAS service is predicted not to be available for a duration of more than _____ min. (COM 3.16.6.2)
9. What does the equipment suffix "G" indicate in item 10 (equipment) on a flight plan? _____ (COM 3.16.7)
10. Can VFR GPS receivers be used to replace current charts? ___ (COM 3.16.16)
11. For air-to-air communications between pilots in the Northern Domestic Airspace (NDA), what is the correct frequency to use? _____ MHz. (COM 5.13.3)
12. An aerodrome forecast (TAF) provides expected conditions for _____ at specific aerodromes, whereas an area forecast chart (GFA) depicts _____ affecting flight at a specific time over a particular area. (MET 3.2.1)
13. Areas of showery or intermittent precipitation are shown on a GFA Clouds and Weather Chart as _____ _____. (MET 3.3.11)
14. In a TAF, any cases of strong, non-conductive low level wind shear within _____ ft AGL will be coded as "__". (MET 3.9.3)
15. In a TAF, "TEMPO" is only used when the modified forecast condition is expected to last less than _____ in each instance. (MET 3.9.3)
16. TAF CYXU 011035Z 011123 27015G25KT 3SM RA OVC005
    BECMG 1314 OVC 020
    FM 1700Z 29005KT P6SM OVC030 TEMPO 1723 BKN030
    RMK NXT FCST BY 17Z =
    In the weather report above, the forecast wind for 1500Z is _____. (MET 3.9.3)
17. SPECI CYSJ 221650Z 08017G24 3/8SM R23/2000FT/N –SN DRSN VV006
    M03/M05 A2953 RMK SN8 VSBY VRBL 3/4 11/2
    In the weather report above, the prevailing visibility is _____ and the visibility is obscured by _____. (MET 3.15.3)
18. Are the winds in aviation weather forecasts and reports given in degrees true or magnetic? GFA: _____; TAF: _____; FD: _____; METAR: _____. (MET 3.3.11, 3.9.3, 3.11, 3.15.3)
19. Does ATC assume responsibility for obstacle clearance when you are radar identified? ___ (RAC 1.5.2)
20. If you observe suspicious ground activities at an abandoned airstrip, what report should you make? _____ (RAC 1.12.2)

Canada

21. Taxi authorizations that contain the instructions "hold" or "hold short" (shall/need not) be read back by the pilot. (RAC 4.2.5)
22. Where possible, pilots are required to report at least ____ min before entering an MF area. (RAC 4.5.7)
23. A _____ must be filed for all flights between Canada and a foreign state. (FAL 2.3.2)
24. On flights from Canada to the U.S., at least _____ advance notice of arrival must be provided to U.S. Customs. (FAL 2.3.2)
25. On flights to Canada, pilots must land at a Canada Customs authorized airport of entry (AOE). Pilots must make their own customs arrangements by calling _____ at least _____ before flying into Canada. (FAL 2.3.2)
26. Pilots receiving a MANOT message are requested to maintain a radio watch on _____ MHz when operating in the vicinity of the track of the missing aircraft. (SAR 2.3)
27. List the four steps that should be accomplished (where practicable) during your preflight inspection of the emergency locator transmitter (ELT).
    (a) _____;
    (b) _____;
    (c) _____; and
    (d) _____. (SAR 3.4)
28. When an ELT signal is heard in flight, the nearest ATS unit should be advised of what four pieces of information?
    (a) _____;
    (b) _____;
    (c) _____; and
    (d) _____. (SAR 3.4)
29. In the event of a crash, what should you do with the ELT's function switch, and when?
    _____ (SAR 3.5)
30. 061234 NOTAMN CYSB SUBDURY
    RWY 04/22 CLOSED TIL APRX 0612151530
    Runway 04/22 is expected to open at _____Z on (date) _____. (MAP 5.6.1)
31. What is the significance of the term "APRX" in the above NOTAM? _____ (MAP 5.6.1)
32. 060210 NOTAMR 060202 CYND WINCHESTER
    CNA8 UNMANNED AERIAL VEHICLE OPS 3NM RADIUS 450610N
    752854W (APRX 9 NM NW AD) SFC TO 2400 FT MSL
    0605051700 TIL 0605052300
    What is the significance of the letter "R" at the end of the word "NOTAM" above? _____ (MAP 5.6.2)
33. A Canadian medical certificate for a private pilot licence is valid in Canada for ___ months if under age 40, and for ___ months if age 40 or older. (LRA 3.2.4)
34. In accordance with CAR 401.08, every applicant for, and every holder of, a flight crew permit, licence or rating shall maintain a _____. (LRA 3.7.6)
35. The flight crew recency requirements address three time periods. To act as pilot-in-command or co-pilot you must meet the _____ recency requirements. If you wish to carry passengers, you must also meet the _____ requirements. (LRA 3.9)
36. In order to carry passengers, you must have completed __ takeoffs and landings in the same category and class of aircraft in the previous __ months. (LRA 3.9)
37. Class A fires are fires in _____. (AIR 1.4.2)
38. An aircraft altimeter which has the current altimeter setting applied to the subscale should not have an error of more than ___ ft when compared on the ground against a known aerodrome or runway elevation. (AIR 1.5.1)
39. By _____ ft ASL the partial pressure of oxygen is such that all pilots will experience mild hypoxia and some will become symptomatic. (AIR 3.2.1)
40. If, on descent, the pressure in the ears (or sinuses) cannot be relieved by swallowing, yawning or Valsalva manoeuvre, it is best to _____. (AIR 3.8)

Answers to this quiz are found on page 38 of this ASL 4/2006.